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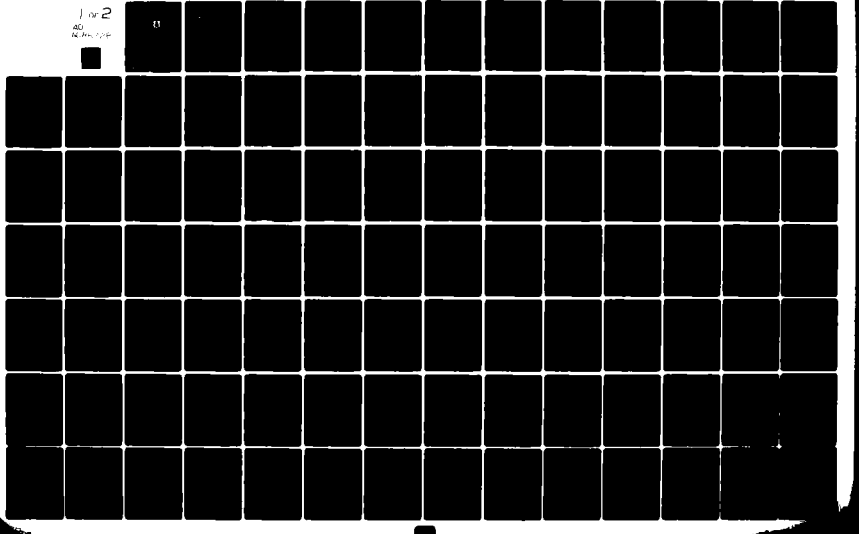

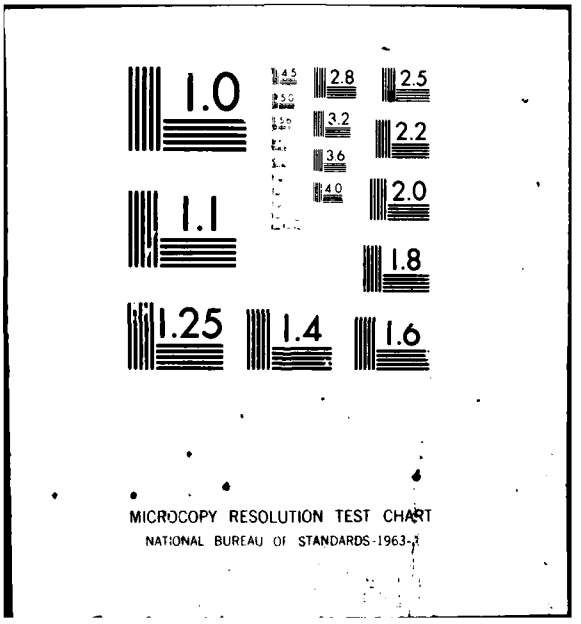
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FOREIGN TECHNOLOGY DIVISION

CONSTRUCTION NORMS STRAIGHTENED
PART II SECTION D
GAS SUPPLY EXTERNAL NETWORKS
AND CONSTRUCTIONS OF THE NORM OF PLANNING
(CHAPTER 13)

by

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(6) CONSTRUCTION NORMS STRAIGHTENED. PART II. SECTION D. GAS SUPPLY EXTERNAL NETWORKS AND CONSTRUCTIONS OF THE NORM OF PLANNING. (CHAPTER 13)

By (10) L. T. Kalacheva, V. M. Rodionova and L. P. Biryukova

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See also Part 2, Section G, Chapter 12, AD-A085 843.

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U. S. BOARD ON GEOGRAPHIC NAMES TRANSLITERATION SYSTEM

Block	Italic	Transliteration	Block	Italic	Transliteratio..
А а	*А а*	A, a	Р р	*Р р*	R, r
Б б	*Б б*	B, b	С с	*С с*	S, s
В в	*В в*	V, v	Т т	*Т т*	T, t
Г г	*Г г*	G, g	У у	*У у*	U, u
Д д	*Д д*	D, d	Ф ф	*Ф ф*	F, f
Е е	*Е е*	Ye, ye; E, e*	Х х	*Х х*	Kh, kh
Ж ж	*Ж ж*	Zh, zh	Ц ц	*Ц ц*	Ts, ts
З з	*З з*	Z, z	Ч ч	*Ч ч*	Ch, ch
И и	*И и*	I, i	Ш ш	*Ш ш*	Sh, sh
Й й	*Й й*	Y, y	Щ щ	*Щ щ*	Shch, [illegible]
К к	*К к*	K, k	Ъ ъ	*Ъ ъ*	"
Л л	*Л л*	L, l	Ы ы	*Ы ы*	Y, y
М м	*М м*	M, m	Ь ь	*Ь ь*	'
Н н	*Н н*	N, n	Э э	*Э э*	E, e
О о	*О о*	O, o	Ю ю	*Ю ю*	Yu, yu
П п	*П п*	P, p	Я я	*Я я*	Ya, ya

*ye initially, after vowels, and after ъ, ь; e elsewhere.
When written as ё in Russian, transliterate as yё or ё.

RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	sinh^{-1}
cos	cos	ch	cosh	arc ch	cosh^{-1}
tg	tan	th	tanh	arc th	tanh^{-1}
ctg	cot	cth	coth	arc cth	coth^{-1}
sec	sec	sch	sech	arc sch	sech^{-1}
cosec	csc	csch	csch	arc csch	csch^{-1}

Russian	English
rot	curl
lg	log

Page 1.

Construction norms straightened.

Part II, section D.

Chapter 13.

Gas supply external networks/grids and ccnstructions of the norm of planning.

SNIP [Construction norms and regulations] of the II-G.13-66.

Are affirmed by the state Committee of the Council of Ministers of the USSR on matters of the building on 14 September, 1966.

Page 2.

Chapter SNIP II-G.13-66 "Gas supply. External networks/grids and constructions. The norms of planning" is developed by the state scientific research and design institute of Giproniigaz of Ministry

of Municipal Services of the RSFSR with the collaboration of the institutes of Mosgazproyekt of Mosgorispolkom [Moscow City Soviet Executive Committee], TsNIIEP of the engineering equipment of state committee on civil/civilian building and the architecture with the GOSSTROY of the USSR Lengiproinzhproyekt of Lengorispolkom [Leningrad City Soviet Executive Committee], Ukrgiprogorpromgaz of the Ministry of Municipal Services of UkrSSR [Ukrainian SSR] and Yuzhniigiprogaz of the ministry of gas industry.

With the introduction to the action of present chapter loses effect the chapter SNIP the II-G.13-66 "Gas supply. External networks/grids and constructions. Norms of planning".

Page 3.

State Committee of the Council of Ministers of the USSR on matters of building (GOSSTROY of the USSR).

Construction norms it straightened.

Gas supply. External networks/grids and constructions. Norms of planning.

SNIP of the II-6.13-66.

Instead of chapter SNIP of the II-6.13-66.

1. General/common/total part.

Field use/application.

1.1. Norms and rules of present chapter apply to planning of external gas piping systems and constructions, intended for gas supply of habitable and public buildings and industrial enterprises, located in cities and other populated areas, by natural, artificial, liquified hydrocarbon and mixed gas with pressure to 12 kg/cm², utilized as fuel.

1.2. Norms and rules of present chapter do not apply to planning:

a) technological gas pipes and constructions of enterprises chemical, oil-refining, metallurgical and other branches of industry;

b) gas pipes with gas pressure are more than 12 kg/cm²;

c) gas pipes from nonmetallic ducts;

d) gas pipes for transportation of liquified hydrocarbon gases in liquid phase.

1.3. During planning of gas pipes from nonmetallic ducts, main-line gas pipes and gas-distributing stations should be been guided requirements of corresponding chapter of SNIP and additional requirements of special indications (for example, on of safety, etc. technique).

General/common/total indications.

1.4. During planning of external gas piping systems and constructions, intended for gas supply of habitable and public buildings and industrial enterprises in cities and other populated areas it follows except demands of present chapter to be guided:

a) by chapter SNIP I-G.9-66 "Gas supply. External networks/grids and constructions. Materials, fittings and part";

b) by chapter SNIP the III-G.7-66 "Gas supply. External networks/grids and constructions. Straightened organizations and productions robot. Inspection/acceptance in the operation";

c) by chapter SNIP the II-G.12-65 "Gas supply. Gas-distributing stations. Cylinder and reservoir installations of liquefied gas. The norms of planning", if is provided for gas supply by the liquified hydrocarbon gases;

d) the "Rules of safety in the gas economy" of Gosgortekhnadzor [State Committee of the Council of Ministers for Supervision of Industrial Safety and for Mining Inspection (RSFSR)] of the USSR;

e) by the appropriate standard documents when building is accomplished/realized in the zones of the propagation of ever-frozen soils, in the regions with the seismicity are higher than 6 points, in the earned additionally territories, on the settled earth and other particular conditions of building.

1.5. In designs of systems of gas supply should be provided for use/application of equipment, materials, instruments and fittings, serially produced by industry, according to Gosts or technical conditions, approved in routine.

When selecting of materials, equipment, instruments and fittings, used for the gas piping systems and the constructions

(duct, shaped piece, etc.), should be been guided the demands of chapter SNIP the I-G.9-66 "Gas supply. external networks/grids and constructions. Materials, fittings and part", taking into account in this case the requirement of "technical rules on the economical consumption of metal, wood cement and on the rational use/application of composite reinforced-concrete and metal constructions in the building" (TP 101-65).

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In projects and specifications of the systems of gas supply must be shown the trademarks of steel, the methods of melting and reduction of steel, utilized to the manufacture of ducts according to appropriate Gosts to steel, Gosts the ducts, and also Gosts, technical specifications or standards to the equipment, the fittings and the instruments.

The note: 1. The use/application of new and prototypes of materials, gas equipment and instruments is allowed/assumed according to the recommendations of the organizations, which developed these materials, equipment and instruments. The recommendations indicated must be affirmed in the routine and matched with the organs/controls of Gosgortekhnadzor and the organizations, which know by the operation of gas economy.

2. Use/application of imported materials and equipment is allowed/assumed, if they satisfy demands of chapter SNIP I-G.9-66 "Gas supply. External networks/grids and constructions. Materials, fittings and part".

1.6. Technical solutions of external gas piping systems and constructions of systems of gas supply must be selected, in necessary cases, on foundation of comparison of indices of competitive versions of these solutions.

1.7. External gas piping systems and constructions should be projected/designed account to need for maximum industrialization of construction-assembly works, due to use/application of composite constructions/designs from standard and standard elements/cells and parts, manufactured at plants and in preparing workshops and demands of chapter SNIP III-G.7-66 "Gas supply. External networks/grids and constructions. Straightened organizations and productions in the works. Inspection in the operation".

The typical dimensions of equipment, instruments and separate structural elements/cells, the provided for in the projects gas supplies, must be standardized.

Note. During the development of designs should be considered the possibility of obtaining of the necessary equipment, instruments and materials for the systems of gas supply in the region of building.

1.8. Gases, utilized in capacity of fuel for gas supply of cities and other populated areas and industrial enterprises, must satisfy requirements GOST _ [All-union State Standard] 5542-50 "Gas for communal general consumption. Technical specifications" and GOST 10196-62 "Gases hydrocarbon, liquified, fuel".

The gas, not purified from the sulfurous compounds, can be utilized as fuel under the condition for fulfilling the demands p of 1.8 chapters SNIP the II-G.11-66 "Gas supply. internal devices. Norms of planning".

1.9. During planning of constructions on gas piping systems (for example, gas-regulator areas, supports, wells, condensate collectors, installations on defense of gas pipes from electrical corrosion, etc.) should be provided for use/application of standard projects and standards to these constructions.

1.10. In projects must be given indications about need for

conducting during intrcduction/input of system of gas supply into operation of setting up and initial operation works on control of system to operational characteristics, indicated in project.

1.11. Order of planning composition and volume of designed documentation of external gas piping systems and structures must correspond to requirements of directive commands of GOSSTROY of the USSR for composition of projects and estimates on building.

2. Systems of gas supply and norm of the gas pressures.

2.1. During the development of the designs of the gas supply of habitable and public buildings, municipal and industrial enterprises, located in the cities and other populated areas, should be provided for use/application as the systems of the centralized gas supply on the external gas piping systems in accordance with the requirements of present chapter, as also local systems of gas supply, examined/considered in chapter SNIP the II-G.12-65 "Gas supply. Gas-distributing stations. Cylinder and reservoir of installations of liquefied gas. Norms of planning".

The field of application one or the other feed system of gas should be set in the project of gas supply on the basis of technical-economic substantiation, and also account of local

conditions.

In the systems of gas supply it is to accept the following categories of the gas pressure:

low - at a pressure of gas is not more than 0.05 kg/cm²;

average - at a pressure of gas is more than 0.05 to 3 kg/cm²;

high - at a pressure of gas is more than 3 to 6 kg/cm²;

high - at a pressure of gas is more than 6 to 12 kg/cm².

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2.2. With centralized gas supply can be used following distribution systems of gas:

a) single-stage, and with supply of gas to users only according to gas pipes of one, as a rule, of low pressure;

b) two-stage, with gas supply to users on gas pipes of two pressures - average and low or high to 6 kg/cm² and low;

c) three-stage, with gas supply by users on gas pipes of three pressures - high to 6 kg/cm², average and low;

d) multistage, with which the distribution of gas is accomplished/realized by gas pipes of four pressures: high to 12 kg/cm², high to 6 kg/cm², averages and low.

Communications between the gas pipes of different pressures, entering the system of gas supply, must be accomplished/realized only through the gas-regulator areas.

2.3. Selection of distribution system of gas should be done depending on sizes/dimensions and planning of city or another populated area, use of gas, arrangement/position of residential and industrial consumers, sizes/dimensions of gas consumption, arrangement of sources of gas supply (gas-distributing stations, gas plants) and physicochemical parameters of gas. The solution must be of technical-economically substantiated.

2.4. Gas-distributing stations of main-line gas pipes must be furnished, as it inculcated, near of gas supplied objective (city, populated area, enterprise), but not are nearer than distances of those determined in accordance with demands of chapter SNIP II-D. 10-62 "Main conduits. Norms of planning".

The selection of the places of the arrangement/position of gas-distributing stations must be produced by the organization, which works out the design of the system of gas supply, with participation of the organization, which develops the design of main-line gas pipe.

3. Calculated gas flows the annual gas flows.

3.1. Annual gas flows for each category of users must be determined to end of calculated period taking into account prospect for development of objectives - users of gas.

The duration of calculated period is more precisely formulated on the basis of the plan/layout of the promising development of objectives - the users of gas with participation of general designer, who works out the project of planning and building-up of city (populated area) or industrial enterprise and designed organization, which works out the project of gas supply.

During the planning it is necessary to determine the order of building taking into account the limit to the gas, established/installed by planning/gliding agencies for the calculated periods.

3.2. Annual expenditures of gas for home-economic and municipal needs in habitable and public buildings, children's and therapeutic institutions, educational institutions, enterprises of public nutrition and objectives of communal general designation/purpose (bath, laundries, bakeries, etc.) should be determined according to norms of gas flow, given in Table 1.

Table 1. Norms of the flow of gas (in the thermal units) for the home-economic and municipal needs.

(1) № п/п	(2) Назначение расходуемого газа	(3) Единица измерения	(4) Расход газа в тыс. ккал
	(5) I. Жилые здания		
1	(6) На приготовление пищи (при наличии в квартире газовой плиты и централизованного горячего водоснабжения)	(7) На 1 человека в год	640
2	(8) На приготовление пищи и горячей воды для хозяйственных нужд без стирки белья (при наличии в квартире газовой плиты и отсутствии централизованного горячего водоснабжения и газового водонагревателя)	(9) То же	810*
3	(10) На приготовление пищи и горячей воды для хозяйственных и санитарно-гигиенических нужд без стирки белья (при наличии в квартире газовой плиты и газового водонагревателя)	»	1270
4	(11) На стирку белья в домашних условиях	(12) На 1 т сухого белья	2100
	(13) II. Детские учреждения		
5	(14) Детские ясли: (15) а) на приготовление пищи	(16) На 1 ребенка в год	490

Key: (1). in sequence. (2). Designation/purpose of expendable gas. (3). Unit measurement. (4). Gas flow in thousand of kcal. (5). I. Habitable buildings. (6). For preparation of food (in presence in apartment of gas stove and centralized hot water supply). (7). To 1 persons per annum. (8). For preparation of food and hot water for economic needs without washing of linen (in presence in apartment of gas stove and absence of centralized hot water supply and gas water heater). (9). Then. (10). For preparation of food and hot water for economic and health and hygiene needs without washing of linen (when in apartment of gas stove and gas of water heater is present). (11). To washing of linen under household conditions. (12). On 1 t of dry linen. (13). II. Children's institutions. (14). Children's creche. (15). for preparation of food. (16). To 1 children per annum.

Continuation Table 1.

	(17) б) на приготовление горячей воды для хозяйственно-бытовых нужд (без стирки белья)	(16) На 1 ребенка в год	430
6	(18) Детские сады:		
	(19) а) на приготовление пищи	(9) То же	570
	(20) б) на приготовление горячей воды для хозяйственно-бытовых нужд (без стирки белья)	»	320
	(21) III. Учреждения здравоохранения		
7	(22) Больницы и родильные дома:		
	а) на приготовление пищи (23)	(24) На 1 койку в год	760
	(25) б) на приготовление горячей воды для хозяйственно-бытовых нужд и лечебные процедуры (без стирки белья)	(9) То же	2200
8	(26) Поликлиники: на лечебные процедуры (без стирки белья)	(27) На 1 посетителя в год	20
	(28) IV. Школы и специальные учебные заведения		
9	(29) Школы, вузы и техникумы: на подогрев завтраков и лабораторные нужды	(30) На 1 обучающегося в год	40
10	(31) Учебные заведения трудовых резервов и школы-интернаты: на лабораторные нужды, приготовление пищи и горячей воды для хозяйственно-бытовых нужд	(9) То же	700
11	(32) Общежития высших и средних специальных учебных заведений: на приготовление пищи и горячей воды для хозяйственно-бытовых нужд	»	500
	(33) V. Коммунально-бытовые предприятия и учреждения		
12	Гостиницы: (34)	(36)	
	(35) а) без ресторанов, с ваннами во всех номерах	На 1 место в год	1200
	(37) б) без ресторанов, с ваннами до 25% номеров	(9) То же	850
13	(38) Прачечные.		
	Стирка белья: (39)	(12)	
	(40) а) в немеханизированных прачечных	На 1 т сухого белья	2100
	(41) б) в немеханизированных прачечных с сушильными шкафами	(9) То же	3000
	(42) в) в механизированных прачечных, включая сушку и глаженье белья	»	4800
14	Дезкамеры. Дезинфекция белья и одежды: (43)		
	а) в паровых дезкамерах (44)	»	535
	б) в огневых дезкамерах (45)	»	300
15	Бани: (46)	(49)	
	а) мытье без ванн (47)	На 1 помывку	9
	б) мытье в ваннах (48)	»	12
	VI. Предприятия общественного питания (50)		
16	(51) Приготовление пищи в общественных столовых и ресторанах:		
	(52) а) приготовление обедов (вне зависимости от пропускной способности столовых и ресторанов)	(55) На 1 обед	1
	(53) б) приготовление завтраков или ужинов	(54) На 1 завтрак или ужин	0,5
	(56) VII. Хлебопекарные и кондитерские предприятия		
17	(57) Выпечка хлебобулочных и кондитерских изделий:	(60)	
	а) хлеба формового (58)	На 1 т изделий	420
	б) хлеба подового (59)	(9) То же	1090
	в) батонов, булок, сдобы (61)	»	950
	г) кондитерских изделий (тортов, пирожных, печенья и т. п.) (62)	»	1450

(63) * При газоснабжении сжиженными углеводородными газами норму расхода газа принимать 710 тыс. ккал.

Key: (17). for the preparation of hot water for of economic-household needs (without the washing of linen). (18). Kindergartens. (19). for preparation of food. (20). for preparation of hot water for home-economic needs (without washing of linen). (21). III. Institutions of public health. (22). Hospitals and maternity wards. (23). for preparation of food. (24). To 1 cot per annum. (25). to preparation of hot water for home-economic needs and therapeutic procedures (without washing of linen). (26). Polyclinics: to therapeutic procedures (without washing of linen). (27). To 1 visitors per annum. (28). IV. Schools and special educational institutions. (29). Schools, VUZ and technical schools: for preheating of breakfasts and laboratory needs. (30). To 1 trainers per annum. (31). Educational institutions of raw materials reserves and boarding school: for laboratory needs, preparation of food and hot water for home-economic needs. (32). Hostels of highest and secondary special educational institutions: for preparation of food and hot water for home-economic needs. (33). V. Municipal-bytovyee of enterprise and institution. (34). Hotels. (35). without restaurants, with baths in all numbers. (36). In 1 place per annum. (37). without restaurants, with baths to 25%/% of numbers. (38). Laundries. (39). Washing of linen. (40). in nonmechanized laundry. (41). in nonmechanized laundry with cabinet driers. (42). in mechanized laundries, including drying and ironing of linen. (43). Disinfection

chambers. Disinfection of linen and clothing. (44). and steam disinfection chambers. (45). in fire disinfection chambers. (46). Baths. (47). washing without baths. (48). washing in baths. (49). For 1 washing. (50). VI. Institutions of public nutrition. (51). Preparation of food in communal dining halls and restaurants. (52). preparation of dinners (without depending on throughput capacity of dining halls and restaurants). (53). preparation of breakfasts or suppers. (54). VII. Baking and confectionery enterprises. (55). To 1 dinner. (56). To 1 breakfast or supper. (57). Baking of bread and bun confectionery articles. (58). grain crops of mold. (59). grain crops of hearth. (60). On 1 t of articles. (61). long loaves, rolls, (62). confectionery articles (cakes, pastry, pastry, etc. (63). In presence of gas supply by liquified hydrocarbon gases norm of gas flow to accept 710 thousand kcal.

Page 7.

The annual expenditures of gas for the home-economic needs of small industrial enterprises and enterprises of everday maintenance/servicing of population (studio, workshops, barbershop, magazines, etc.) can be accepted in the size/dimension to 10o/o of the total gas flow by users, indicated in sections I-V Table 1.

3.3. Annual expenditures of gas for technological needs of

industrial enterprises are determined by acting specific norms of fuel consumption and volume of released production or on given actual fuel-consumption with correction for change efficiency in equipment and instruments with work on gas fuel.

3.4. Annual expenditures of gas for needs of heating and ventilation for all categories of users should be determined in accordance with instructions of chapters SNIP II-G.7.62 "Heating, ventilation and air conditioning. Norms of planning" and the II-G.10.62 "Thermal networks/grids. the norm of planning".

Hourly consumptions of gas.

3.5. Distribution system of gas must it relies on maximum by hourly flow rate, determined on combined diurnal conditions of use of gas by all users.

3.6. Calculated hourly consumption of gas $Q_{p.ч}$ in $нм^3/ч$ (at 0°C and pressure of gas 760 мм Hg) for household -everyday and municipal needs is recommended to define as share of annual gas flow according to formula

$$Q_{p.ч} = k_m Q_{год}, \qquad (1)$$

where k_m - coefficient of hour maximum (conversion factor from annual flow rate to maximum hourly consumption of gas); $Q_{год}$ - annual

gas flow in nm^3/yr.

The coefficient of hour maximum of the gas flow should be accepted differentiated by each region of the gas supply whose networks/grids represent the independent system, not hydraulically connected with the systems of other regions.

The values of the coefficients of hour maximum of the gas flow for the cities and other populated areas in depending on population, supplied with gas, are given in Table 2, and for the the communal general requirements - in Table 3.

3.7. Calculated hourly consumption of gas per technological and heating needs of industrial enterprises should be defined as share of annual fuel consumption according to formula (1) with use/application of coefficients of hour maximum and correction for change efficiency in equipment and instruments with work on gas fuel.

The values of the coefficients of hour maximum of the gas flow for the industrial enterprises are set during the planning on the basis of the data about the character of production and the regimes of fuel-consumption (with the composition of combined diurnal graph) for each enterprise individually.

Table 2. Values of the ccefficients of hcur maximum of the flcw of gas (without the heating) for the cities and cther populated areas in depending on the number cf population, supplied with gas.

Число жителей, снабжаемых газом, в тыс. чел. (1)	Коэффициент часового максимума k_m (2)
1	1/1800
2	1/2000
3	1/2050
5	1/2100
10	1/2200
20	1/2300
30	1/2400
40	1/2500
50	1/2600
100	1/2800
300	1/3000
500	1/3300
750 (3)	1/3500
1000 и более	1/3700

Key: (1). Number of inhabitants, supplied with gas, in thousand of man. (2). Coefficient of hour maximum. (3). and more.

Table 3. of value of the coefficients of hourly maximum of the gas flcw for the communal general enterprises.

(1) Наименование предприятия	(2) Коэффициент часового максимума k_m в пределах
Бани (3)	1/1600—1/2300
Прачечные (4)	1/2300—1/3000
Больницы (5)	1/2500—1/3000
Гостиницы (6)	1/1800—1/2200
Предприятия общественного питания (7)	1/1800—1/2200

(8) Примечание. Для бань и прачечных коэффициенты часового максимума расхода газа приняты с учетом расхода газа на нужды отопления и вентиляции.

Key: (1). Designation cf enterprise. (2). Coefficient of hour maximum

k_m in limits. (3). Baths. (4). Laundry. (5). Hospitals. (6). Hotels. (7). Enterprises of public nutrition. (8). Note. For baths and laundries the coefficients of hour maximum of the gas flow are taken taking into account the expenditure of gas for the needs of heating and ventilation.

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For industrial enterprises, the building and the putting into commission of which is provided for during the calculated period, the calculated hourly consumptions of gas are received according to the data of the projects of these enterprises, and in the absence of designed documentation - on the basis of the data about that planned/glided size of enterprises and enlarged flow numbers of fuel as analogous enterprises.

3.8. When are known quantity and types of adjustable gas instruments, calculated hourly consumption of gas Q_p in nm/³h should be determined on sum of nominal gas flows adjustable instruments with consideration diversity factor of their action according to formula

$$Q_p = \sum_{i=1}^{m} k_0 q_i n_i, \qquad (2)$$

where $\sum_{i=1}^{m}$ - sum of products of values of k_0, q_i and n_i from 1 to m; k_0 -coefficient of simultaneity for uniform instruments or groups of

instruments; q_i - nominal gas flow by instrument or by group of instruments in nm^3/h; n_i - quantity of uniform instruments or groups of instruments; m - quantity of types of instruments or groups of instruments.

The value of diversity factor k_o for habitable buildings in depending on a quantity of gas supplied apartments, types and quantity of adjustable in them gas instruments should be taken on Table 4.

3.9. Nominal hourly consumptions of gas gas instruments and gas burning devices should be accepted according to specifications or according to technical characteristics of instruments.

The tentative data about the nominal gas flows the most widely used gas instruments of the communal general designation/purpose are given in Table 3 of chapter SNIP the II-G.11-66 "Gas supply. Internalization of device. Norms of planning".

3.10. Calculated hourly consumptions of gas in heating and ventilation should be determined in accordance with instructions of chapters SNIP II-G.7-62 "Heating, ventilation and air conditioning. Norms of planning" and the II-G.10-62 "Heating networks/grids. Norms of planning".

Table 4. Values of diversity factor k_0 for the habitable buildings in depending on a quantity of gas supplid apartments, types and quantity of established/installed gas instruments.

(1) Количество квартир	(2) Тип и количество установленных приборов					
	(3) плита 4-конфорочная	(4) плита 2-конфорочная	(5) плита 4-конфорочная и газовый проточный водонагреватель	(6) плита 2-конфорочная и газовый проточный водонагреватель	(7) плита 4-конфорочная и емкостный водонагреватель	(8) плита 2-конфорочная и емкостный водонагреватель
1	1	1	0,72	0,75	1	1
2	0,65	0,84	0,46	0,48	0,59	0,71
3	0,45	0,73	0,35	0,37	0,42	0,55
4	0,35	0,59	0,31	0,325	0,34	0,44
5	0,29	0,48	0,28	0,29	0,287	0,38
6	0,28	0,41	0,26	0,27	0,274	0,34
7	0,27	0,36	0,25	0,26	0,263	0,3
8	0,265	0,32	0,24	0,25	0,257	0,28
9	0,258	0,289	0,23	0,24	0,249	0,26
10	0,254	0,263	0,22	0,23	0,243	0,25
11	0,25	0,253	0,21	0,22	0,237	0,245
12	0,245	0,254	0,207	0,215	0,232	0,24
13	0,243	0,249	0,2	0,21	0,229	0,236
14	0,241	0,245	0,195	0,205	0,226	0,231
15	0,24	0,242	0,19	0,2	0,223	0,228
20	0,235	0,23	0,181	0,19	0,217	0,222
25	0,233	0,221	0,178	0,185	0,215	0,219
30	0,231	0,218	0,176	0,184	0,213	0,216
35	0,229	0,215	0,174	0,183	0,211	0,213
40	0,227	0,213	0,172	0,18	0,209	0,211
45	0,225	0,212	0,171	0,179	0,206	0,208
50	0,223	0,211	0,17	0,178	0,205	0,205
60	0,22	0,207	0,166	0,175	0,202	0,202
70	0,217	0,205	0,164	0,174	0,199	0,199
80	0,214	0,204	0,163	0,172	0,197	0,198
90	0,212	0,203	0,161	0,171	0,195	0,196
100	0,21	0,202	0,16	0,17	0,193	0,196
400	0,18	0,17	0,13	0,14	0,15	0,152

Note: 1. For the municipal apartments whose kitchens are completed more than by one uniform instrument, the calculated gas flows we must define, considering that the instruments of one apartment work with the same diversity factor, as if these

instruments equipped several apartments each of which was completed by one instrument of this type.

2. For apartments equipped by gas everyday plate/slab (2- or 4-burner) about as heating furnaces, diversity factor is received as for apartments, equipped by the same plate/slab and capacitive water heater.

Key: (1). Quantity of apartments. (2). Type and quantity of established/installed instruments. (3). plate/slab 4-burner. (4). plate/slab 2-burner (5). plate/slab 4-burner and gas flowing water heater. (6). plate/slab 2-burner and gas flowing of water heater. (7). plate/slab 4-burner and capacitive water heater. (8). plate/slab 2-burner and capacitive water heater.

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3.11. Calculated gas flow per sections of distributive external low-pressure gas pipes, which have incidental gas flows, should be defined as sum of consumption of transit and casing-head gases with coefficient of 0.5.

4. Gas pipes.

General requirements.

4.1. Requirements of present section apply to design of external networks/grids of gas pipes from gas-distributing stations, gas-regulator areas, gas plants, etc. to users of gas, involving introductions/inputs of gas pipes into separate buildings and constructions with tripping devices during introductions/inputs.

4.2. External networks/grids of gas pipes according to designation/purpose are subdivided into:

a) distributive gas pipes, which go from gas-distributing

stations, gas-regulator areas, gas plants, etc. (switching on intrablock gas pipes and gas pipes in territory of industrial enterprises), from which are provided for gas pipes for introduction/input of gas into individual buildings and constructions:

b) gas pipes for introduction/input of gas into separate buildings and constructions.

4.3. Gas pipes in depending on maximum operating pressure of gas in them are subdivided into following categories:

a) low-pressure gas pipes - with gas pressure not are more than 0.05 kg/cm²;

b) gas pipes of mean pressure - with gas pressure are more than 0.05 to 3 kg/cm²;

c) high pressure supply lines - with gas pressure are more than 3 to 6 kg/cm²;

d) high pressure supply lines - with gas pressure are more than 6 to 12 kg/cm².

Note. For low-pressure gas pipes during the supplying of artificial gas is established/installed the pressure to 0.02 kg/cm², natural - to 0.03 kg/cm², liquified - to 0.04 kg/cm². Is allowed/assumed an increase the gas pressure to 0.05 kg/cm² in low-pressure gas pipes during the setting up in the residential and communal general consumers of individual or group regulators - the stabilizers of pressure.

4.4. Distributive gas pipes are intended:

a) low-pressure gas pipes - for gas supply of habitable and public buildings, and also of small communal general and industrial users;

b) gas pipes of average/mean and high pressure with gas pressure to 6 kg/cm² - for feeding of distributive gas pipes of low and mean pressure (through gas-regulator areas), and also of industrial and communal general enterprises (through local to gas-regulator areas and gas-regulator settings up);

c) gas pipes high(ly)-about the pressures with the gas pressure are more than 6 to 12 kg/cm² - for the gas supply to the urban gas-regulator areas, the local gas-regulator areas of major enterprises, and also the enterprises whose technological processes

require the use/application of high-pressure gas from 6 to 12 kg/cm².

4.5. Connection of steel tubes of external gas pipes should be provided for during welding.

In this case it is necessary to consider that the welded joints of gas pipes are subject to testing by physical methods of check in accordance with the demands of chapter SNIP III-G.7-66 "gas supply. External networks/grids and constructions. Straightened organizations and productions in the works. Inspection acceptance in the operation".

Flange joints it is allowed/assumed to provide for for installation of catches, taps/cranes and another fittings.

The material of packing for the flange joints of gas pipes should be established/installed project in accordance with the demands of chapter SNIP I-G.9-66 "gas supply. External networks/grids and constructions. Materials, fittings and part".

4.6. Use of threaded connections on external gas pipes is [illegible]/assumed to provide for only in following cases:

[illegible] installation of taps/cranes, plugs and clutches on

collectors/collections of condensate and water locks;

b) during above-ground introductions/inputs of low-pressure gas pipes into sites of installation of close fitting valve;

c) for connection of monitoring and measuring instruments.

The use/application of threaded connections for the underground gas pipes to all gas pressures is not allowed/assumed.

Hydraulic design of gas pipes.

4.7. Diameters of distributive gas pipes, and also introductions/inputs must be determined by hydraulic design of condition of guaranteeing normal gas supply of all users into hours of maximum gas consumption and be on internal diameter not less than 50 mm for distributive street gas pipes and not less than 25 mm - for intrablock gas pipes and introductions/inputs.

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The selection of the diameter of ducts according to Gosts should be produced taking into account the limiting assortment of ducts. The wall thickness of ducts one should determine by calculation, in this

case the wall thicknesses of the ducts of underground gas pipes must be not less than 3 mm, above-ground - not less than 2 mm.

4.8. Hydraulic regimes of work of distributive gas pipes of average/mean and high pressures must be accepted from conditions of creation with maximum permissible gas pressure drops of most economical and reliable in use of system, which ensures stability of work of gas-regulator areas and gas-regulator installations, and also burner operation of municipal and industrial users in permissible pressure ranges.

4.9. Calculated (permissible) pressure differential in low-pressure gas pipes must be accepted, on the basis of permissible oscillations/vibrations of thermal loads of household gas devices. The nominal gas pressures before the household gas devices must correspond to those indicated in Table 1 of chapter SNIP II-G.11-66 "gas supply. Internal devices. Norms of design".

In depending on the taken in the project nominal gas pressures before the household gas devices it should establishe the following maximum gas pressures in the distributive gas pipes after the gas-regulator areas:

a) 300 mm H_2O - at a nominal pressure of gas in the gas

instruments 200 mm of water st.;

b) 200 mm H_2O - at a nominal pressure of gas in gas instruments 130 mm H_2O.

Table 5. Design pressure differentials in mm H_2C in the external low-pressure gas pipes and their distribution between the street, yard and house networks/grids.

(1) № п/п	(2) Используемый газ	(3) Суммарный перепад давления от газорегуляторного пункта до наиболее удаленного прибора	(4) В том числе на сеть		(5) Распределение перепада давления между дворовой и домовой сетью			
					(6) при застройке			
			(7) уличную	(8) дворовую и домовую	(9) многоэтажной		(10) одноэтажной	
					(11) на сеть			
					(12) дворовую	(13) домовую	дворовую	домовую
1	(14) Природный чисто газовых и газонефтяных месторождений, смеси сжиженных углеводородных газов с воздухом и другие газы с низшей теплотой сгорания 8000—10 000 *ккал/нм³* при номинальном давлении газа перед бытовыми газовыми приборами 200 *мм вод. ст.* . . .	120	120	60	25	35	35	25
2	(15) То же, при номинальном давлении газа перед бытовыми газовыми приборами 130 *мм вод. ст.*	115	80	35	10	25	20	15
3	(16) Искусственный и смешанный с низшей теплотой сгорания 3500—4500 *ккал/нм³* при номинальном давлении газа перед бытовыми газовыми приборами 130 *мм вод. ст.*	115	80	35	10	25	20	15

Note. With the gas supply of newly of the gasified cities, it is settlement or their city blocks, and also regions of new building-up by gases of purely gas and gas-petroleum deposits, with the mixtures of the liquified hydrocarbon gases with air and other gases with the lowest heat of combustion 8000-10000 kcal/nm³ one should in the projects accept the nominal gas pressure before the household gas devices 200 mm H_2O. The nominal gas pressure before the household gas devices 130 mm H_2O is allowed/assumed to accept for previously the gasified cities, it is settlement or their city blocks with the

already created systems of gas supply with the nominal gas pressure indicated in household gas devices.

Key: (1). in sequence. (2). Utilized gas. (3). Total pressure differential from gas-regulator area to outermost instrument. (4). Among other things to network/grid. (5). Distribution of pressure differential between yard and house network/grid. (6). with building-up. (7). street. (8). yard and house. (9). multistage. (10). single-stage (11). to network/grid. (12). yard. (13). house. (14). Natural purely gas and gas-petroleum deposits, mixtures of liquified hydrocarbon gases with air and other gases with lowest heat of combustion 8000-10000 kcal/nm^3 at nominal pressure of gas before everyday gas devices 200 mm H_2O. (15). Then, at nominal pressure of gas before household gas devices 130 mm of water. (16). Artificial and mixed with lowest heat of combustion 3500-4500 kcal/nm^3 at nominal pressure of gas before household gas devices 130 mm H_2O.

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4.10. Distribution of design pressure differential in low-pressure networks/grids between street distributive gas pipes, yard conduits (intrablock gas pipes and introductions/inputs) and internal (house) gas pipes should be produced, being guided by data, given in Table 5.

4.11. During design of systems of gas supply liquefied gas from group cylinder settings to pressure differentials in distributive gas pipes, introductions/inputs and internal gas pipes (networks/grids) should be accepted on pos. of 1 table 5. When gas supply by liquefied gas is temporary/time (with the subsequent translation/conversion into the supply with natural gas), network/grid must be projected/designed from the conditions of the possibility of its use in the future on the natural gas, i.e., the calculation of network/grid must be produced in these cases for the natural gas (respectively on pos. 1 or pos. or 2 this tables) whose quantity is determined as equivalent (on the heat of combustion) to calculated flow rate in nm^3 of liquefied gas.

4.12. Hydraulic design of low-pressure gas pipes should be performed according to formula

$$H = 64\lambda \frac{Q^2}{d^5} \gamma l, \qquad (3)$$

where H - losses of pressure in kgf/m_2; λ - coefficient of hydraulic resistance; Q - gas flow in nm^3/h; d - bore of gas pipe in cm; γ - specific gravity/weight of gas in kgf/nm^3 at temperature of 0°C and pressure 760 mm Hg; l - calculated length of gas pipe m.

In depending on the state of motion of gas along the gas pipe

and the corresponding coefficients of hydraulic resistance for calculating the low-pressure gas pipes are recommended the following formulas:

a) for the stream-line conditions of the flow of gas, characterized by Reynolds number Re≤2000 and $\lambda=64/Re$

$$H = 115\,420\,\frac{Q}{d^4}\nu\gamma l, \qquad (4)$$

where ν - kinematic viscosity coefficient of gas in m^2/s at temperature of 0°C and pressure 760 mm Hg;

b) for critical behavior with Re=2000-4000 and $\lambda=0.0025\sqrt[3]{Re}$

$$H = 0{,}0526\,\frac{Q^{2{,}333}}{d^{5{,}333}\,\nu^{0{,}333}}\gamma l; \qquad (5)$$

c) for the turbulent regime with Re>4000 and $\lambda=0.11\left(\frac{k_э}{d}+\frac{68}{Re}\right)^{0.25}$

$$H = 7\left(\frac{k_э}{d}+1922\,\frac{\nu d}{Q}\right)^{0.25}\frac{Q^2}{d^5}\gamma l, \qquad (6)$$

where $k_э$ - equivalent absolute roughness of the internal surface of the wall of duct in cm.

4.13. Hydraulic calculation of gas pipes of average/mean and high pressure in entire area of turbulent state of motion of gas should be performed according to formula

$$\frac{P_н^2-P_к^2}{l} = 1{,}45\cdot 10^{-3}\left(\frac{k_э}{d}+1922\,\frac{\nu d}{Q}\right)^{0.25}\frac{Q^2}{d^5}\gamma, \qquad (7)$$

where $P_н$ - absolute pressure of gas in the beginning of gas pipe in kg/cm²; $P_к$ - absolute pressure of gas at the end of gas pipe in kg/cm².

Note. The value of the equivalent absolute roughness of the internal surface of walls $k_э$ for the steel tubes should be taken as the equal to 0.01 cm.

4.14. During hydraulic designs of gas pipes it should be used tables and nomograms, developed on basis of formulas, led in paragraphs 4.12 and 4.13.

4.15. Losses of pressure in local resistances (elbow, T-joints, close fitting valve, etc.) should be considered with method of increase in calculated length of gas pipes by 5-10%.

In the sections of small extent from the complicated by configuration loss of pressure in the network/grid of gas pipes should be determined in accordance with the indications p. 6.8 of chapter SNIP II-G.11-66 "the gas supply. Internal devices. Norms of design.

4.16. During calculation of low-pressure gas pipes, laid under conditions of sharply pronounced variable/alternating area relief,

should be calculated hydrostatic pressure head, determined on the basis of formula

$$H_r = \pm z(\gamma_в - \gamma_г), \qquad (8)$$

where H_r - hydrostatic pressure head (change in gas pressure with change in altitude of situation of gas pipes) in kgf/m²; z - difference in geometrical marks of gas pipe m; $\gamma_в$ - specific gravity/weight of air in kgf/nm³ at temperature of 0°C and pressure 760 mm Hg; $\gamma_г$ - specific gravity/weight of gas in kgf/nm³ at temperature of 0°C and pressure 760 mm Hg.

Note. Sign (+) relates to the higher marks, sign (-) to the lower marks of gas pipe with respect to the initial plane.

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4.17. Hydraulic design of circular networks/grids of gas pipes must be fulfilled with connecting/fitting of pressure of gas at mesh points of calculated rings during maximum use of calculated gas pressure drop. The discrepancy of losses of pressure in the ring is allowed/assumed to 10%.

Packing of gas pipes.

4.18. Packing of gas pipes for gas supply to objective-users of

independently from their designation/purpose and gas pressure must be provided for, as a rule, on passages of cities and other populated areas and on territories of industrial enterprises.

4.19. In territory of cities and other populated areas all gas pipes independent of their designation/purpose and gas pressure must, as a rule, be packed in soil.

In the territories of industrial and communal general enterprises one should apply the predominantly above-ground packing of gas pipes.

The packing of intrablock (yard) above-ground gas pipes on the residential sections or the supports and on the facades of the projected/designed and existing habitable and public buildings and also the device of the open base/socket inputs is allowed/assumed according to the agreement with the organs/controls of architectural supervision.

For the blasting of gas pipes and discharge/break of condensate during the base introductions/inputs is allowed/assumed the installation of plugs. Plugs can be established/installed only outside the knowledge. The diameter of plug must be not more than 25 mm.

Note. During the design of the external gas pipes of liquefied gases should be been guided additionally the chapter SNIP II-G.12-65 "gas supply. Gas-distributing stations. Cylinder and reservoir of installation of liquefied gas. Norms of design".

4.20. Packing of external gas pipes on streets and quarters should be provided for in technical zone or band of green cultivations, avoiding or possibility of packing of gas pipes on passages with improved road surfaces.

4.21. Packing of distributive gas pipes by transit through territories of enterprises, storages and the like (in the absence of possibility of other packing) it is allowed/assumed to provide for for gas pipes with gas pressure to 6 kg/cm^2 under condition of guaranteeing permanent access to these territories of workers of traffic departments.

On the route of the gas pipe, which passes on the territory of enterprise or storage, must be isolated the right of way in wide not less than 2 m, on which is not allowed/assumed the storing of materials and equipment, or arrangement of temporary/time constructions.

4.22. Introductions/inputs of gas pipes into shops of industrial and municipal enterprises must be provided for directly into room, de are located aggregates/units, which use gas, or into adjacent with it room, under condition of connecting these rooms by open door aperture. In this case the exchange of air in the adjacent room must be not less triple in the hour.

4.23. It is not allowed/assumed input unit of gas pipes into machine rooms, ventilation and elevator chambers/cameras and mines/shafts, rooms of trash collectors, electrical distribution devices, storage rooms, rooms of dangerously explosive productions, or other rooms into which cannot be provided service personnel's 24-hour access.

4.24. Introductions/inputs of gas pipes into habitable buildings must be provided for into uninhabited ones, open-door ones of gas pipes of room (for example, staircases, kitchens, corridors).

The introductions/inputs of gas pipes into the public buildings, the buildings of children's and therapeutic institutions, educational institutions, enterprises of public nutrition and objectives of the communal general designation/purpose can accomplish/realize into the

stairwells, , the corridcrs cr it is direct intc the rocms where are established/installed gas instruments.

Is permitted input unit intc the technical corridors and the undergrounds, and also tasements, which dc nct have the special technical corridcrs, urder the ccndition for fulfilling tne demands paragraphs of 6-34-6.36 chapters SNIP II-G.11-66 "gas supply. Internal devices. Norms cf design".

4.25. Intersecticns of external gas pipes with railroad and tramroads, and also with roads must be accomplished/realized, as a rule, at angle cf 90°.

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Is allowed/assumed with the appropriate technical and economic substantiatien the decrease of intersection argle fcr the undergrcund and above-ground gas pipes tc 45°.

Underground gas pipes.

4.26. Distances cr horizcntal between underground gas ccnduits and other constructions and ccmmunications shculd be accepted during design nct less than valtes, indicated in Table 6.

A design of the combined packing of gas pipes with the pressure to 3 kg/cm² in the general/common/total trench with other underground communications should be accomplished/realized taking into account the requirements of the corresponding standard documents.

During the gasification of the reconstructed buildings the introductions/inputs of the conduits/manifolds of thermal networks/grids must be sealed in accordance with the demands p. 11.17 of chapter SNIP II-G.10-62 "the thermal networks/grids of the norm of design.

4.27. Is allowed/assumed combined packing of gas pipes with pressure to 0.05 kg/cm² in underground collectors/receptacles in accordance with requirements of "temporary/time indications in accordance with design of intrablock engineering communications in collectors/receptacles, of technical undergrounds and technical corridors" (SN 338-65), affirmed by state committee on civil/civilian building and architecture with GOSSTROY of the USSR.

Semiaccess and passage channels must be equipped by continuously effective natural ventilation.

In the semiaccess channels between the habitable and public buildings ("coupling" for the contained packing of utility networks) is allowed/assumed the packing only of low-pressure gas pipes.

4.28. Packing of gas pipes in impassable channels jointly with conduits/manifolds of thermal network/grid, water pipe or cables of different designation/purpose is not allowed/assumed.

Table 6. Minimum distances s cn the horizontal in the light/wcrld between the underground gas pipes and cther ccnstructions and communications.

(1) Газопровод	(2) Здания и сооружения (до среза фундамента)	(3) Железнодорожные пути (до крайнего рельса)	(4) Трамвайные пути (до крайнего рельса)	(5) Водопровод (до стенки трубы)	(6) Канализация, водосток (до стенки трубы)	(7) Тепловая сеть (до наружной стенки канала)	(8) Силовые кабели до 35 кв	(9) Телефонные кабели: Фундирование	Телефонные кабели: в канализации	(10) Деревья (до ствола)	(11) Воздушные линии электропередачи в кв (от фундамента опоры): (14) до 1 кв	до 35	(15) свыше 35 кв
(17) Низкого давления не более 0,05 кгс/см² . . .	2	3	2	1	1	2	1	1	1	1,5	1	5	10
(18) Среднего давления более 0,05 до 3 кгс/см² . . .	4	4	2	1	1,5	2	1	1	1,5	1,5	1	5	10
(19) Высокого давления более 3 до 6 кгс/см²	7	7	3	1,5	2	2	1	1	2	1,5	1	5	10
(19) Высокого давления более 6 до 12 кгс/см²	10	10	3	2	3	4	2	1	3	1,5	1	5	10

Notes: 1. The distarce cf gas pipe cf the tushes is nct regulated.

2. Distance from gas pipe tc external wall cf wells and chambers/cameras of undergrcund structures must be nct less than 0.3 m. Gas pipes in these sections must be fulfilled frcm the seamless pipes and not have welded joints.

3. Distances, indicated in tarle, dc nct apply tc combined packing in one trench ct gas pipes with cther undergrcund communications.

4. Distances from gas pipes to supports of airlines of communications, overhead electric transport power line of streetcar, trolley bus and electrified iron roads should be accepted as to supports of air electric power lines of corresponding stress/voltage.

Key: (1). Gas pipe. (2). Buildings and construction (to edge of foundation). (3). railroad ways (to extreme rail). (4). Tramroads (to extreme rail). (5). Water pipe (to wall of duct). (6). Canalization/sewerage, drain (to wall of duct). (7). Thermal network/grid (to external wall of channel). (8). Power cables to 35 kV. (9). Telephone cables. (10). Trees/wood (to shank). (11). Air electric power lines in kV (from foundation of support). (12). armor plated. (13). in canalization/sewerage. (14). to. (15). it is more than 1 to 35. (16). it is more than. (17). low pressure not more than 0.05 kg/cm^2. (18). Mean pressure it is more than 0.05 to 3 kg/cm^2. (19). High pressure is more 6 to /2 kg/cm^2.

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4.29. Is allowed/assumed packing of two and more than gas pipes in one trench. In this case the distances between the gas pipes in the light/world should be accepted sufficient ones for production of

assembly and repair of conduits/manifolds.

However, these distances must be for the ducts: by diameter to 300 mm - not less than 0.4 m, by the diameter more than 300 mm - not less than 0.5 m.

4.30. In individual sections routes, and also with packing between buildings and other zones of buildings of gas pipes with gas pressure to 6 kg/cm², distances of buildings and underground structures, established/installed in Table 6, can be reduced under condition of applying of seamless pipes and bent withdrawals, testing of all welded joints by physical methods of check, imposition of very reinforced insulation and guarantee of safety of underground structures during repair of each of them.

The decrease of the distances, indicated in Table 6, for the gas pipes with the gas pressure of more than 6 to 12 kg/cm² is not allowed/assumed.

4.31. Vertical distance between underground gas pipes and other underground structures (water pipe, thermal network/grid, telephone canalization/sewerage, drains, fecal canalization/sewerage, etc.) during their mutual intersection must be in light/world not less than 0.15 m, and between gas pipe and electric cable or armor plated

telephone cable not less than 0.5 m.

Is allowed/assumed the decrease of the distance between the gas pipe and the electric cable or the telephone cable to 0.25 m under the condition of cable laying in housing from the ducts. The length of cover must be such that the ends of the cover would be not nearer than 1 m of the walls of the intersected gas pipe.

Is allowed/assumed the device of covers from nonmetallic ducts.

4.32. Intersections with underground gas pipes with gas pressure are more than 6 kg/cm² of collectors/receptacles, wells and tunnels of different designation/purpose it is not allowed/assumed.

The gas pipes with the gas pressure to 6 kg/cm², the intersecting underground structures indicated, must be laid in the cover, covered with anticorrosion insulation/isolation. The ends of the covers must be derived/concluded not less than on 0.5 m beyond the limits of the extreme walls of constructions.

4.33. Installation on gas pipes of fittings and collectors/collections of condensate is allowed/assumed not nearer than 2 m of territory of intersected communications or constructions.

4.34. Gas pipes, which transport dry gas, in nonbuckling and weakly-swelling soils it is allowed/assumed to lay in zone of freezing of soil. The minimum depth of the laying of gas pipes on the passages with the improved coatings (asphalt-concrete, concrete, etc.) must be not less than 0.8 m, and in the sections without the improved road surfaces - not less than 0.9 m to the top of duct.

In the places where is not provided for the motion of transport, the depth of the laying of gas pipes can be reduced to 0.6 m.

4.35. Gas pipes, which transport humid gas, must be laid lower than zone of freezing of soil with draft/gradient not less than 0.002 with installation up of condensate collectors at lowest points.

The introductions/inputs of the gas pipe of humid gas into the buildings and the constructions must be laid in direction of distributive gas pipe. If on corditions of area relief cannot be created the necessary draft/gradient to the distributive gas pipe, is allowed/assumed the fracture of gas pipe in the profile/airfoil with installation of condensate collector at lowest point.

For the gas pipes, which transport the drained gas, the creation of drafts/gradients and the installation of condensate collectors are not necessary.

4.36. With packing of gas pipes in rock ones, and also with small bearing capacity (it is less than 0.25 kg/cm²) soils should be provided for device under gas pipe of basis/base of sandy soil (not containing crushed stone and other large/coarse hard spots) in thickness not less than 20 cm, or filling of gas pipe to height not less than 20 cm above upper generatrix of duct by the same sandy soil.

Above-ground gas pipes.

4.37. Above-ground packing of gas pipes can be provided for:

a) on external walls of buildings not are lower than IV degree of refractoriness:

habitable and public buildings, with conditions of agreement between local organs/controls or architectural supervision;

industrial buildings with productions, placed on fire hazard in categories D and E.

Note. Is allowed/assumed the packing of gas pipes on the external walls of the buildings indicated and in the case of the presence of the built-in in them transformer substations (including on the walls of substations themselves), in reference on the fire hazard to the productions of category C;

b) on the incombustible coatings of buildings the I and II degree of refractoriness with the productions, placed on the fire hazard in categories D and E;

c) on the separate columns (supports) and the piers from the incombustible materials.

Notes: 1. The packing of high pressure supply lines is permitted on the anechoic incombustible walls or above the windows of the upper levels of production buildings.

2. On buildings of production shops and heating boiler rooms is allowed/assumed intersection with gas pipes of low and mean pressure of window apertures along impost of anechoic (nonopening) interlacings.

3. In points of intersections with deformation (precipitation) welds gas pipes must freely rest or supports for guaranteeing autocompensation in the case of their nonuniform sag.

4.38. Above-ground gas pipes must be projected/designed taking into account compensation for stretch deformations according to actually possible temperature conditions for work of these gas pipes and if necessary (when is not provided autocompensation) to provide for installation of compensators (lens, U-shaped, etc.). The use/application of gasket compensators is not allowed/assumed.

4.39. Gas pipes on walls of buildings must be laid without disturbance/breakdown of architectural elements/cells of facade at the height open-door and repair and eliminating possibility of their mechanical damage.

In the sections under the window apertures and the balconies flanged or threaded connections are not allowed/assumed.

4.40. Ducts and fittings or above-ground gas pipes with transportation of humid gas is recommended to cover/coat with heat insulation.

Need for the heat insulation of gas pipe and its

construction/design in depending on climatic conditions are established/installed by project. As the heat insulation should be applied dry insulating materials.

4.41. Gas pipes, which transport humid gas, it is necessary to pack with draft/gradient not less than 0.003, with installation at lowest points of devices for removing condensate (drain pipes).

The gas pipes, which transport the drygas, can be laid without the drafts/gradients.

4.42. Distances on horizontal in light/world from above-ground gas pipes, laid on supports, to buildings and constructions must be not less than values, indicated in Table 7.

Table 7. Minimum distances on the horizontal in the light/world between the above-ground gas pipes and the buildings or the constructions.

(1) № п/п	(2) Наименование зданий или сооружений	(3) Расстояние до зданий или сооружений в м
1	(4) Производственные здания и склады с производствами, относящимися по пожарной опасности к категориям А, Б и В до газопроводов с давлением газа до 6 *кгс/см²*	5
2	(5) То же, до газопроводов с давлением газа более 6 до 12 *кгс/см²*	10
3	(6) Производственные здания с производствами, относящимися по пожарной опасности к категориям Г и Д до газопроводов с давлением газа до 5 *кгс/см²*	2
4	(5) То же, до газопроводов с давлением газа более 6 до 12 *кгс/см²*	5
5	(7) Жилые и общественные здания до газопроводов с давлением газа до 0.05 *кгс/см²*	2
6	(5) То же, до газопроводов с давлением газа более 0.05 до 6 *кгс/см²*	5
7	(8) Ближний рельс железнодорожного или трамвайного пути	3
8	(9) Бордюрный камень, внешняя бровка кювета или подошва насыпи дороги . . .	1,5
9	(10) Подземные коммуникации (водопровод, канализация, трубы теплофикации, телефонная канализация, электрические кабельные блоки), считая от края фундамента опоры газопровода	1
10	(11) Ограда открытой электроподстанции : : :	10
11	(12) Место выпуска расплавленного металла и источники открытого огня	(14) 10
12	(13) Провода воздушных линий электропередачи	Не менее высоты опоры линии электропередачи
13	(15) Провода воздушных линий электропередачи в стесненных условиях	(16) Не менее указанного в табл. 9 при условии защитного заземления газопровода

Notes: 1. On paragraphs 7-12 tables of distance are shown of the gas pipes of all categories or the gas pressures.

2. If height of support or gas pipe exceeds height of supports of electric power line, distance between gas pipe and lines of power transmission should be accepted not less than height of support of gas pipe.

3. Indicated in table distances from buildings do not exclude possibility of packing of gas pipes on walls and coatings of these buildings in accordance with requirements p. 4.37.

4. In individual sections with impossibility to maintain distances, indicated in paragraphs 3 and 4 tables, are allowed/assumed decrease of distances indicated with conditions of constructive connecting/fitting of foundations of supports of gas pipe with foundations of buildings lengthwise which is laid above-ground gas pipe.

Key: (1). in sequence. (2). Designation of buildings or constructions. (3). Distance of buildings or constructions m. (4). Production buildings and storages with productions, which relate on fire hazard to categories A, B and C to gas pipes with gas pressure to 6 kg/cm². (5). Then, to gas pipes with pressure of gas is more 6 to 12 kg/cm². (6). Production buildings with productions, which relate on fire hazard to categories D and E to gas pipes with gas pressure to 6 kg/cm². (7). Habitable and public buildings to gas pipes with gas pressure to 0.05 kg/cm². (8). Near rail of railroad or tramroad. (9). Curb, external edge container or bottom of mound are expensive. (10). Underground communications (water pipe,

canalization/sewerage, duct or district heating, telephone canalization/sewerage, electrical cable blocks), counting from territory of foundation of support of gas pipe. (11). Enclosure of open electric substation. (12). Place of output of molten metal and sources of free flame. (13). Leads/ducts of air electric power lines. (14). Not less than height of support of electric power line. (15). Leads/ducts of air electric power lines under squeezed conditions. (16). Not less indicated in Table 9 with corditions of shielding grounding gas pipe.

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4.43. Clearances between above-ground gas pipes and conduits/manifolds of another designation/purpose during their combined packing and intersection must be accepted those not less indicated in Table 8.

Table 8. Minimum clearances in mm between the above-ground gas pipes and the conduits/manifolds of another designation/purpose during their combined packing and intersection.

(1) Диаметры условного прохода труб D_y в мм	(2) До 300	(3) Более 300 до 600	(4) Более 600
(5) До 300	100	150	150
Более 300 до 600	150	150	200
Более 600	150	200	300

Key: (1). Diameters of the internal diameter of ducts D_y in mm. (2). To. (3). It is more.

4.44. During intersections with air electric power lines above-ground gas pipes must pass lower than electric power lines.

Distances from the gas pipes to the leads/ducts of air electric

power lines on the vertical line should be accepted in depending on voltage according to Tables 9.

In the point of intersection with the electric power lines on gas line must be provided for the enclosure/protection for the protection from the incidence/drop on it in the electric leads. Enclosure/protection must speak on both sides of intersection in favor of the outside wires of electric power lines up to the same distances such as are shown in Table 9 for the vertical breakage between the gas pipes and the air electric power lines of the corresponding stresses/voltages.

All elements/cells of gas pipe must be reliable grounded. The value of contact resistance of the grounding of gas pipe must be not more than 10 ohms.

Table 9. Minimum vertical distances in the light/world between the above-ground gas pipes and the air electric power lines during the intersections.

(1) Величина напряжения в кв	(2) Расстояние в м
(3) До 1	1
» 20	3
35—110	4
150	4,5
220	5
330	6
500	6,5

Notes: 1. Distances from the leads/ducts of air electric power line to any part of the gas pipes and their protruding constructions/designs are determined on the horizontal with the greatest deviation of leads/ducts, and on the vertical line - with the greatest deflection.

2. During determination of minimum vertical and horizontal distances between air electric power lines and gas pipe of any kind shielding enclosures/protections, established/installed above it in the form of grates, galleries, areas/sites, are considered as parts of gas pipe.

Key: (1). Value of stress/voltage in kV. (2). Distance m. (3). To.

4.45. Is allowed/assumed packing on supports or piers of gas

pipes with conduits/manifolds of another designation/purpose under condition of guaranteeing of free inspection and repair of each of conduits/manifolds.

Is allowed/assumed fastening conduits/manifolds to the gas pipes of low or mean pressure, if this allows their bearing capacity.

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Note. With the packing of gas pipes jointly with the conduits/manifolds with the agressive liquids the latter must be laid lower than the gas pipe at a distance not less than 25 cm. In the presence on the conduits/manifolds with the agressive liquids of flanged and threaded connections, and also fittings is compulsory the device of the shielding deflectors, which prevent the incidence/impingement of agressive liquids to the gas pipe.

4.46. Combined packing to some supports of gas pipes and permanent or temporary/time power lines is not allowed/assumed, except power lines, laid in steel tubes, armored cables, or cables of dispatcher system and of signaling, intended for servicing of gas pipe.

4.47. Greatest permissible value of flight/span between supports

of steel gas pipes, which transport dry gas, should be determined from strength conditions of multispan girder system, taking into account all possible effects on gas pipe during its operation (internal pressure, snow and load due to wind, stretch deformations, etc.), and also conditions of assembly (with guarantee or without guarantee of indestructibility of construction/design).

For the gas pipes, which transport humid gas, the permissible value of the flight/span between the supports must be established/installed from the conditions of the sagging/deflection of gas pipe taking into account the weight of insulation/isolation, conditions of precipitation of supports, withdrawal of condensate and drafts/gradients of gas pipe.

The maximum sagging/deflection of gas pipes must be not more

$$\Delta = 0{,}02D_y, \qquad (9)$$

where D_y - conditional diameter of gas pipe.

The procedure of calculation of flights/spans and value of loads on the gas pipes should be accepted, being guided by the instructions of chapter SNIP the II-G.10-62 "Main conduits. Norms of design".

In the regions of the propagation of ever-frozen or settled earth, and also in the territories, chipped away by pit mining, and

under other similar conditions of building the maximum permissible value of the flight/span between the supports should be taken taking into account the possibility of the precipitation of the separate supports of gas pipe, being guided by the requirements of the corresponding standard documents.

The recommended permissible maximum flights/spans between the supports of steel gas pipes for the drained and humid gases are given in Table 10.

Table 10. Recommended permissible maximum flights/spans between the supports of steel gas pipes.

(1) Наружный диаметр газопровода и толщина стенки в мм	(2) Рекомендуемый максимальный пролет в м				
	(3) по условиям прочности			(4) по условиям прогиба при уклоне 0.000	
	(5) без учета выпадания опор	(6) с учетом выпадания опор	(7) с учетом гидравлического испытания	(8) неизолированного газопровода	(9) изолированного газопровода
22×2,5	5	3,5	5	2,5	1
25×2,5	5,5	4	5,5	3	1,3
32×2,5	6	4,5	6	3,5	1,6
38×2,5	7	5	7	4	1,9
48×3	8	6	8	4,5	2,2
57×3	9	6,5	9	5	2,7
76×3	10	7,5	10	6	3,4
89×3,5	12	8,5	12	6,5	4
108×4	14	10	14	7	4,5
133×4	15	11	15	8	5
159×4,5	17	12	17	10	7
219×6	20	14,5	20	12	9,5
273×7	24	17	24	14,5	11,5
325×3	26	19	26	16,5	13,5
377×8	27	19	27	18,5	15,5
426×6	28	20	26	20,5	17
478×6	29	21	26	22,4	18,3
530×6	31	22	26	24	20
630×6	32	23	26	28	22,5
720×7	35	25	28	31	25,5
820×7	36	26	28	34	27,5
920×7	37	26	26	37	30
1020×7	40	28	29	40	32
1220×9	44	31	31	44	37

1. Indicated in table values of flights/spans are determined for girder multispan (3 and more than flight/span) continuous/solid construction/design of gas pipe with compensation for stretch deformations. For one- and double-transit constructions/designs the effective span to accept with coefficient of 0.88.

2. Calculation is made for ducts from st. 2 with yield point 2200 kg/cm² taking into account weight of additional structures and

ice-covered surface according to IV region.

Key: (1). Outside diameter of gas pipe and wall thickness in mm. (2). Recommended maximum flight/span m. (3). according to strength conditions. (4). according conditions of sag with draft/gradient 0.000. (5). without taking into account precipitation of supports. (6). taking into account precipitation of supports. (7). taking into account hydraulic test. (8). uninsulated gas pipe. (9). isolated/insulated gas pipe.

4.48. Packing of gas pipes of all gas pressures on railroad bridges is not permitted.

Gas pipes with the gas pressure to 6 kg/cm² it is allowed/assumed to lay on the incombustible (reinforced-concrete, metallic and stoneware) motor-and-animal and foot bridges, and also on the dams and other water-engineering constructions under the condition of the substantiation of the advisability of packing by the technical and economic calculations and agreeing the solutions adopted with the organizations in conduct of which are found the constructions.

The suspended to bridges gas pipes must be fulfilled only from the steel seamless pipes (use/application of wrought pipes is allowed/assumed with D_y>400 mm) and to have compensators. The elements/cells of bridge must be respectively checked for the increment loads from the gas pipes.

The packing of gas pipes in the channels of bridges is not allowed/assumed.

The gas pipes, suspended to the bridges, must be arranged/located in such a way that would be eliminated the possibility of the accumulation of gas in the constructions/designs of bridge.

ADDITIONAL REQUIREMENTS FOR THE PACKING OF GAS PIPES UNDER THE PARTICULAR CONDITIONS OF BUILDING.

Regions of ever-frozen soils.

4.49. During design of networks/grids and constructions of systems of gas supply in regions or ever-frozen soils besides demands of present chapter should be considered additional requirements, presented to constructions, which are constructed on ever-frozen soils in accordance with demands of chapter SNIP of II-B.6-66

"Basis/base and foundations of buildings and constructions on ever-frozen soils. Norms of the design" and of "Indications in accordance with the design of the populated places, enterprises, buildings and constructions in the northern construction-climatic zone" (SN 353-66).

4.50. Assortment, technical requirements, rules of inspection/acceptance and methods for testing, and also marking and packing of steel tubes, disconnecting, gauging and other fittings must be accepted according to special technical specifications.

4.51. Design of anticorrosion defense of gas pipes should be fulfilled taking into account special features/peculiarities of ever-frozen soils (high humidity of soils with their thawing, possibility of freezing insulation/isolation with soil, swelling of soils with freezing, etc.).

For the corrosion protection of the threaded connections of above-ground gas pipe, and also equipment and fittings, established/installed on it, should be provided for the use/application of the canning lubrication.

4.52. For purpose of decrease of thermal effect of gas pipe on soils permissible oscillation/vibration of temperature of gas, which

enters distribution networks, is recommended to limit with limits of ±10°C. The thermal effect of gas pipes must not decrease the bearing capacity of soils in the bases/bases under the neighboring communications.

Note. The measures, which ensure gas supply into the urban networks/grids with the temperature within the limits indicated, must be reflected in the project of main-line gas pipe and gas-distributing station and be fulfilled by the organization, which supplies gas.

Earned additionally territories.

4.53. Design of gas pipes, planned in earned additionally territories, must be accomplished/realized with necessary fulfilling of requirements of "Indications in accordance with design of buildings and constructions in earned additionally territories" (SN 289-64) and other standard documents, which reflect particular conditions of design in earned additionally territories.

4.54. Project of gas line must contain mining geological substantiation, comprised in accordance with geological study of region of building of gas pipe as a result of all conducted on deposit geological survey and mining/mountain-operational works.

4.55. Overall diagram gas supplies and measures for defense of gas pipes from adverse effects of mine workings, substantiated by results of calculating deformation of earth's surface, must be matched with organization, which operates deposit, and with local organs/controls of Gosgortekhnadzor [- State Committee of the Council of Ministers for Supervision of Industrial Safety and for Mining Inspection (GKSIPI)], being guided in this case by command "About order of assertion of measures for protection of constructions and natural objectives from adverse effect of mine workings and about order of conducting mountain works in protective pillars" Gosgortekhnadzor of USSR.

4.56. Calculations of strains of earth's surface and stresses/voltages in gas pipe should be performed in accordance with specially developed procedure.

For the stage of designed assignment the calculations of strains can be produced employing the simplified procedure.

4.57. During development of designed assignment it is necessary to consider plans/layouts of mine workings for next 20 years, while during development of working drawings - to next 5-7 years.

4.58. Tracing of gas pipes is recommended to connect with plan of mountain work and to produce predominantly on territories, in which already ended process of displacement of earth's surface or extra earnings of which is outlined in later periods, and also on territories where expected strains of earth's surface will be relatively less.

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4.59. Orientation of routes of distributive gas pipes relative to direction of stretch of layers, if there is possibility of selection of diverse variants, must be produced taking into account technical and economic calculations according to these versions.

4.60. During especially intense development of strains, for example during development of suites of steep layers, is recommended above-ground packing of gas pipes.

4.61. Value of flights/spans and construction/design of supports of above-ground gas pipes must be determined on the basis of condition of possibility of precipitation of any of supports.

4.62. Wall thickness of ducts of underground gas pipes is calculated on longitudinal stresses taking into account the effect of deformations of earth's surface and must be not less than 4 mm for ducts $D_y<100$ mm and not less than 6 mm - for ducts $D_y>100$ mm.

4.63. Compensators, used for perception of longitudinal travel, which appear in gas pipe during deformation of earth's surface, must satisfy the requirements of gas density during expected deformations and at operating pressures.

4.64. For underground gas pipes without depending on operating pressure must be used only steel fittings.

Withdrawals, angle plates and other shaped pieces should be applied prefabrication. In the case of their manufacture on the bases of building organizations all welded joints of shaped pieces must undergo by physical method of check.

4.65. Introductions/inputs of all forms of underground communications (water pipe, heating main, canalization/sewerage, telephone cable, electrical cable, etc.) into gasified buildings, and also into nongasified during arrangement of introductions/inputs into them at a distance of less than 50 m from gas pipe with pressure to 3 kg/cm² and less than 80 m of high pressure supply line must be

shielded from penetration through them of gas into buildings.

The defense of communications in the points of intersections with the underground gas pipes, and also the defense of the introductions/inputs of communications into the buildings from the gas permeation must be produced in accordance with the special standards, matched with the organs/controls of gas supervision.

Regions with the seismicity of more than 6 points.

4.66. Design of gas pipes and constructions on them in regions with seismicity of more than 6 points should be fulfilled taking into account demands of chapter SNIP II-A.12-62 "Building in seismic regions. Norms of design".

Settled, swelling, swelling and filled soils.

4.67. Design of gas pipes and constructions on them in settled earth should be connected with taken in region of building methods of using settled earth as bases/bases under buildings and constructions in accordance with demands of chapters SNIP II-B.2-62 "Basis/base and foundations of buildings and constructions on settled earth. Norms of design", III-B.10-62 "Building on the settled earth. It straightened organization, production and inspection/acceptance of the works" and

of "Indications on the design of networks/grids and constructions of water supply, canalization/sewerage and thermal networks/grids on the settled earth" (SN 280-64).

4.68. Design of gas pipes and constructions on them in swelling soils should be connected with taken in region of building methods of using swelling soils as bases/bases under buildings and constructions in accordance with requirements of "Temporary/time indications in accordance with design of bases/bases and foundations of buildings and of constructions, raised on swelling soils" (SN 331-65).

4.69. During design of gas pipes and constructions on them in swelling soils should be considered demands of chapter SNIP II-B.1-62 "Basis/base of buildings and constructions. Norms of design".

4.70. Design of gas pipes and constructions on them in filled soils should be fulfilled taking into account special technical specifications, developed/processed with design and affirmed in routine.

Transitions of the gas pipes through the water obstacles, the ravines, etc.

4.71. Transitions of gas pipes of all categories of gas

pressures through rivers, channels, ravines and other similar barriers/obstacles can be provided for by underwater ones (by inverted siphons) or above-water ones.

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A selection of the underwater or above-water type of transition must be substantiated by the technical and economic calculations and the local conditions of production in the works.

Above-water transitions in the cities and other populated areas can be used only according to the agreement with the organs/controls of architecture supervision.

The transitions of the gas pipes through the rivers, the channels, deep ravines, iron roads and highways in the earned additionally territories, as a rule, must be provided for by above-ground ones.

4.72. Underwater transitions across rivers must as far as possible be provided for in rectilinear pool sections perpendicular to axis/axle of flow, in places of smallest width of poured floodplain with slanting ascended shores of river bed of river.

4.73. Underwater transitions of gas pipes must be provided for, as a rule, into two threads with throughput capacity of each of 0.75 calculated gas flows.

Is allowed/assumed packing into one thread:

a) the rung gas pipes, if with the cutoff/disconnection of inverted siphon is provided the gas supply of the users;

b) blind gas pipes to the industrial users in such a case, when given users can pass to another form of fuel for the period of the repair of the inverted siphon;

c) with the width of water obstacle into the low-water level to 50 m and poured floodplains not more than 500 m (on the year of 10% security) and the durations of water-table elevation by flood water not are more than 20 days.

Note. Sometimes, when justified, is allowed/assumed the packing of the second (spare) thread or gas pipe during the intersection of water obstacles in width less than 50 m with the unstable bottom and the coasts.

4.74. Minimum distances on horizontal between transitions of gas pipes through water obstacles and bridges must be accepted on Tables 11.

Table 11. Minimum distances on the horizontal between the transitions of the gas pipes through the water obstacles and the bridges.

(a) № п/п	(b) Характеристика перехода и моста	(c) Расстояние по течению в м	
		(d) выше мостов	(e) ниже мостов
1	Переходы через судоходные замерзающие реки и каналы. Мосты всех типов	300*	50
2	Переходы через судоходные незамерзающие реки и каналы. Мосты всех типов	50	50
3	Переходы через несудоходные замерзающие реки, каналы и т. п. Мосты многопролетные	300*	50
4	То же, мосты однопролетные	20	20
5	Переходы через несудоходные незамерзающие реки, каналы и т. п. Мосты всех типов	20	20

Key: (a). in sequence. (b). Characteristics of transition and bridge. (c). Distance with flow s. (d). it is higher than bridges. (e). it is lower than bridges. (1). Transitions through navigable freezing rivers and channels. Bridges of all types. (2). Transitions through navigable nonfreezing rivers and channels. Bridges of all types. (3). Transitions through unnavigable freezing rivers, channels, etc. Bridges are multispan. (4). Then, bridges single-span. (5). Transitions through unnavigable nonfreezing rivers, channels, etc. Bridges of all types.

FOOTNOTE *. This distance can be reduced according to the agreement with the organizations, responsible for conducting to the bridges of ice-blasting works with the passage of spring seasonal flood. ENDFOOTNOTE.

4.75. Underwater transitions of gas pipes through rivers and other water obstacles must be performed by lengthy ducts.

4.76. To provide for packing two threads of gas pipe into one trench is allowed/assumed on unnavigable rivers and rivers, immune to eroding/scouring.

In this case the distance between the gas pipes in the light/world on the horizontal must be not less than 0.5 m.

With the separate packing of gas pipes the distance between the parallel threads should be designated on the basis of the hydrogeological conditions and the conditions of production in the works on the digging of underwater trenches. In this case the distance between the gas pipes on the horizontal must be: with the diameter to 500 mm - not less than 30 m, with the diameter more than 500 mm - not less than 40 m. In the floodland sections this distance must be not less than 30 m for all diameters of gas pipes.

4.77. Depth of laying of gas pipe into soil on transitions across navigable and alloyed rivers should be accepted not less than 1 m, and on other rivers - not less than 0.5 m, counting from level

of possible eroding/scouring of bottom to top of gas pipe.

The designed mark of the bottom should be determined taking into account a promising change in the regime of water obstacles (as a result of the deepening of the bottom, expansion of river bed, lift of the horizon/level, cuttings, reformations of river bed, erosion/scouring of the coasts, etc.).

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On the transitions through the unnavigable and nonfloatable water obstacles is allowed/assumed according to the agreement with the appropriate basin control of rivers and channels the decrease of the depth of the laying of gas pipe up to packing of it directly to the bottom.

4.78. Width of trenches on bottom must be accepted in dependence on methods of its development, drift and character of soils, but in all cases must exceed diameter of gas pipe with hung up loads not less than on 1 m.

The slope/transconductance of the slants of trench must be accepted taking into account the category of soils on the basis of the instructions of the corresponding chapters SNIP.

4.79. Ballasting of underwater gas pipes, as a rule, must be produced by reinforced-concrete loads or concreting of duct. Is allowed/assumed with appropriate basis the use/application of cast iron loads.

4.80. For underwater gas pipes must be provided for very reinforced insulation.

4.81. In each underwater transition by gas pipe of navigable rivers must be established/installed signal signs of guard zone of established/installed samples/specimens.

The sites of installation of signal signs should be accepted according to the effective republic rules of floating on the internal waterways and the local rules of floating, established/installed for each basin.

Near each transition must be established/installed the permanent reference points:

with the width of low-water river bed to 50 m on one shore;

with the greater width - on both shores.

4.82. Use/application of above-ground (above-water) transitions is recommended through water obstacles with unstable river bed and coasts, with high rates of flow of water (it is more than 2 m/s), and also through deep ravines and beams/gullies.

Transitions can be realized in the form of strut, arched and suspended systems, and also in the form of piers. Preference should be loosened single-span constructions.

The transitions of gas pipes must be open-door and repair with the aid of the stationary or movable means (for example, bridges, suspension cradles, telescopic towers, assembled on the motor vehicles or the floating craft and, etc.).

The height of the above-water transition of gas pipe should be accepted:

a) during the intersection of unnavigable or nonfloatable rivers - not are less than 1 m of the maximum flood level on the year of 10o/o security, but when, on these rivers, short passage is present, - on the year of 1o/o security:

b) during the intersection of navigable and allcyed rivers - not less than 1 m of the above-water part of the river vessels and floats according to the data of local basin controls.

4.83. Supporting structures of transitions of gas pipes must be made from incombustible materials and provide mechanical strength and stability of gas pipes with any possible loads.

4.84. On transitions of gas pipes through ravines and grooves in regions of propagation of ever-frozen soils in presence of underground thawed ground is not allowed/assumed setting up of supports at boundaries/interfaces of thawed and frozen soils.

Transitions of the gas pipes through railroad, tramroads and highways.

4.85. Transitions of gas pipes through railroad, tramroads and highways can be projected/designed with above-ground ones and underground ones in depending on local conditions and economic advisability.

The transitions of the gas pipes through railroad and tramroads and highways in the indentations of the earned additionally territories, as a rule, must be provided for by above-ground ones.

The designs of the transitions of gas pipes must be matched with the organizations in conduct of which are found the intersected constructions.

4.86. On underground transitions of main-line railway lines of general/common/total network/grid, tramroads, and also highways I and II classes packing of gas pipes of all gas pressures should be provided for in covers.

Is allowed/assumed the packing of gas pipes in the ventilation transport and pedestrian tunnels, and also in the collectors/receptacles for the combined packing of underground structures.

The transitions of gas pipes under the railway lines of general/common/total network/grid should be provided for only in the steel covers. Transitions under tramroads and highways I and II classes it is allowed/assumed to accomplish/realize in steel, cast iron, reinforced-concrete, asbestos cement and other covers, which satisfy the conditions of strength and service life.

The ends of the shielding covers must have the sealing packings/seals in accordance with the effective standards. On the end of the cover must be established/installed the overflow pipe which is derived/concluded under the carpet.

The ends of the covers or tunnels must be brought out for the bottom of mound, but not less than on 3 m of the extreme rails of iron road and not less than 2 m or the extreme rails of tramroads or from the territory of the transient part of highway.

4.87. Diameter of cover for defanse of gas pipes should be accepted more diameter of gas pipe not less than on 100 mm with diameter of gas pipe to 200 m and not less than on 200 mm with diameter of gas pipe of more than 200 mm.

Gas pipes in the limits of cover must have a minimum quantity of welded joints, be covered/coated with the very reinforced insulation to be packed to the centering dielectric packing.

In the limits of cover all welded joints of gas pipe must be checked by physical methods of check.

4.88. Depth of packing gas pipe under main-line railway lines of general/common/total network/grid should be accepted not less than 1.5 m counting from bottom of tie to top of cover of gas pipe.

Under tramroads and ways of the sidings of industrial enterprises the depth of packing gas pipe should be accepted not less than 1 m.

The depth of packing gas pipe under the highways should be accepted not less than 1 m from the roadbed to the top of the cover of gas pipe, but in the absence of cover - to the top of gas pipe.

4.89. Height of arrangement of above-ground transitions of gas pipes must be established/installed taking into account guarantee of free passage of transport and pass of person, but not less than values, indicated in Table 12.

Table 12. Minimum height of the packing of above-ground gas pipes (from the lower point of the construction/design of the transition of gas pipe).

№ п/п	(b) Прокладка газопроводов	(c) Высота прокладки в м
1	В непроезжей части территории в местах прохода людей	2,2
2	На свободной территории вне проезда транспорта и прохода людей . .	0,5
3	В местах пересечения автомобильных дорог	4,5
4	В местах пересечения путей неэлектрифицированных железных дорог (до головки рельса)	5,6
5	В местах пересечения электрифицированных участков железных дорог и трамвайных путей (до головки рельса)	7,1*
6	В местах пересечения с контактной сетью троллейбуса	7,3*
7	В местах пересечения внутризаводских железнодорожных путей для перевозки жидкого чугуна или горячего шлака (до головки рельса) . . .	10
8	То же, при устройстве тепловой защиты газопровода	6

Key: (a). in sequence. (b). Packing of gas pipe. (c). Height of packing m. (1). In impassable part of territory in places of person's pass. (2). In free territory out of passage of transport and pass of person. (3). In points of intersection of highways. (4). In points of intersection of ways of unelectrified iron roads (to cap/knot of rail). (5). In points of intersection of electrified railway divisions and tramroads (to cap/knob of rail). (6). In points of intersection with overhead electric transport power line of trolley bus. (7). In points of intersection of in-plant railway lines for transport of liquid cast iron or hot slag (to cap/knob of rail). (8).

Then, with device of heat shield or gas pipe.

FOOTNOTE [1]. In all cases the minimum distance of gas pipe of the parts of the overhead electric trarsport power line of the electrified iron road, streetcar and trolley bus must be not less:

a) for the grounded gas pipe - 0.45 m;

b) for the ungrounded gas pipe - 1.5 m.

SETTING UP OF TRIPPING DEVICES.

4.90. Setting up or tripping devices must be provided for in following places;

a) at introductions/inputs and outputs/yields from gas-regulator areas and depositories of gas;

b) on distributive gas pipes of high and mean pressure for cutoff/disconnection of individual sections (without disturbing gas supply of other sections); quantity of catches it is determined by planning organization taking into account gas capacitance, importance

and technological special features/peculiarities of enterprises;

c) on distributive low-pressure gas pipes for cutoff/disconnection of separate city blocks;

d) on branching from distributive gas pipes of all pressures to enterprises or to groups of habitable and public buildings (house ownerships, quarters);

e) during the introductions/inputs of gas pipes into the separate habitable, public and production buildings;

f) during the intersection with the gas pipes of water obstacles (in accordance with the requirements p. 4.98), main-line railway lines of general/common/total network/grid and arterial automobile roads I and II classes (in accordance with the requirements p. 4.99);

g) with the packing of gas pipes in the collector/receptacle (at the entrance, and with the circular networks/grids and the output/yield from it).

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4.91. On underground gas pipes tripping devices, as a rule, must

be established/installed in wells together with expansion bellows.

On the gas pipes of small diameter $D_y < 100$ mm instead of the expansion bellows one should apply the bent or welded with the sharply bent withdrawals U-shaped compensators.

In the places with the high standing of the level of ground water is permitted to carry out tripping devices into the above-ground locking metallic cabinets.

The arrangement of cabinets must be coordinated with the organs/controls of architectural supervision.

4.92. Tripping devices on branching from distributive gas pipes must be established/installed, as a rule, out of territory of objective, at a distance possibly smaller to distributive gas pipe and not less than on 2 m of line of building-up, wall of building or enclosure/protection is convenient and available for maintenance/servicing place.

4.93. Sections of ring distributive gas pipes, which pass in territory of enterprises, must have tripping devices, placed out of territory of enterprise.

With the blind distributive gas pipes is allowed/assumed the setting up of one tripping device to the territory of enterprise (on the course of gas).

4.94. During base introductions/inputs of gas pipes either during introductions/inputs from above-ground gas pipes setting up of tripping devices during introductions/inputs should be provided for within or outside building or construction. In this case the site of installation of tripping device must be available for the maintenance/servicing, providing the possibility of the rapid cutoff/disconnection of gas supply.

During the setting up of tripping devices during the introduction/input within the building it is allowed/assumed to place them in the staircases, the reels and the corridors.

With the gas supply by liquefied gas the tripping device on the introduction/input of gas pipe must be established/installed only outside the building.

Is not allowed/assumed the setting up of tripping devices in the sections of gas pipes under windows and balconies of buildings and constructions.

4.95. If necessary for setting up on gas pipes, laid in underground passage collectors/receptacles or in semiaccess channels, linear disconnecting catches latter must be placed in pressurized compartments or be established/installed out of collector/receptacle or channel.

4.96. During intersection with gas pipes of air electric power lines tripping devices or gas pipes if necessary should be provided for at a distance not less than 10 m from point of intersection with electric power lines (counting from outside wires).

4.97. With packing in one trench of two and more than gas pipes adjustable close fitting valve must be misaligned relative to each other.

4.98. On underwater transitions of gas pipes through water obstacles setting up of tripping devices must be provided for on both [illegible].

[illegible] the initial blind transitions of gas pipes the tripping [illegible] can be established/installed only on one shore, to the [illegible] on the course of gas), but with the width of water [illegible] more than 15 m the setting up of tripping devices is not [illegible] each specific case is determined by planning

organization in depending on local conditions with the agreement with the organizations, which accomplish/realize operation of the given gas piping systems.

4.99. On transitions of gas pipes of all categories of gas pressures through main railway lines of general/common/total network/grid and highway I and II classes must be established/installed catches:

with blind gas pipes - to transition (on course of gas);

with rung gas pipes - on both sides of transition.

Distances from the transition to the tripping device must be not more than 100m.

During the intersection with the gas pipes of industrial and approach railway lines the setting up of tripping devices and covers is not necessary and is solved by planning organization in depending on the importance of the serviced enterprises and value of goods traffic.

4.100. On gas pipe before gas-regulator area, and also after it setting up of tripping devices should be provided for at a distance not less than 5 m and not more than 100 m.

In the industrial and municipal enterprises the tripping device before the gas-regulator area can not be established/installed, if the tripping device, available on the withdrawal from the distributive gas pipe, is located from the gas-regulator area at a distance not more than 100m.

In the industrial and municipal enterprises, which have one-sided feeding by gas, the tripping device after gas-regulator area can not be established/installed, if the units and the shops, which consume gas, are located from the gas-regulator area at a distance not more than 100 m, or with decompression of gas in the gas-regulator area to the low with the blind gas pipes.

For the gas-regulator areas, placed in the annexes to the buildings, and also the cabinet gas-regulator areas it is allowed/assumed to establish/install tripping device in the external above-ground gas pipes in the convenient and available for the maintenance/servicing place at a distance less than 5 m from the gas-regulator area.

CONSTRUCTIONS ON THE GAS PIPES.

WELLS AND CARPETS.

5.1. Wells should be provided for on underground gas pipes, as a rule, in sites of installation of tripping devices and compensators.

The device of wells must be provided for from the moisture-proof, rotproof and incombustible materials (concrete, reinforced concrete, brick), by composite ones or monolithic ones on the standard drawings and the standards.

5.2. In places of pass of gas pipe through walls of well should be provided for covers whose ends must fall outside wall of well from both sides not less than on 2 cm.

The diameter of cover must provide the independent upsetting of the walls of well and gas pipe.

space between the gas pipe and the cover must be sealed by resinous rope and it is consolidated by filling by bitumen.

5.3. In humid soils to avoid penetration of ground water in wells, and also damages of walls or wells as a result of swelling of

soil, wall of wells it should be projected/designed with reinforced-concrete ones with taking of measures, which prevent wells from effect of swelling.

The surface of the walls of wells outside must be smooth, plastered with the iron plating, and for decreasing the cohesion/coupling with the frozen soil - it is covered with tarry moisture-proof substances.

5.4. Carpets must be provided for for protection from mechanical damages of overflow pipes and vent lines of condensate collectors, water locks and adjustable on them fittings.

Carpets must be established/installed to concrete, reinforced-concrete or other bases/bases, which ensure stability and eliminating their sag.

5.5. For all flange joints of fittings and equipment in wells must be provided for shutting cross connections in accordance with effective standards.

MONITORING AND MEASURING AREAS AND REFERENCE POINTS.

5.6. For systematic check and observation of corrosion state of

gas pipes and effectiveness of action of protective system of their from corrosion should be provided for device of monitoring and measuring areas. A quantity of the monitoring and measuring areas for potential measurement on the underground gas pipes is established/installed by project.

The distance between measuring points of the potentials of gas pipe must be not more than 200 m.

Besides the general/common/total monitoring and measuring areas, adjusted along the length of route, the monitoring and measuring areas should be established/installed in all transitions under railroad ways, through the water obstacles, and also in the points of the intersection with the gas pipe of tramroads, ways of the electrified iron ones it is dear and in the sites of installation of insulating flanges.

5.7. As monitoring and measuring areas for potential measurement of underground gas pipe relative to soil is allowed/assumed to utilize suitable for electrical measurements elements/cells of gas pipe (condensate collectors, introductions/inputs, catches, etc.).

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MAY 80 L T KALACHEVA, V M RODIONOVA

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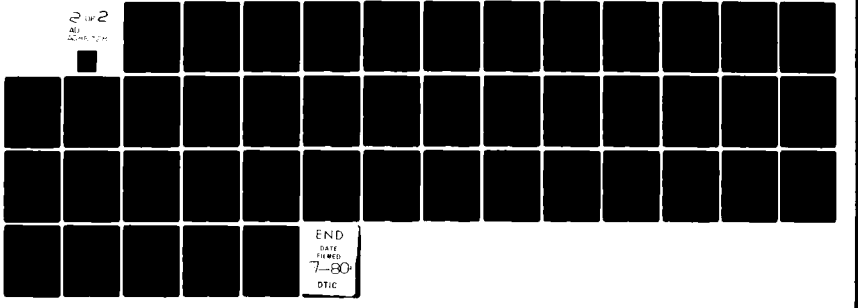

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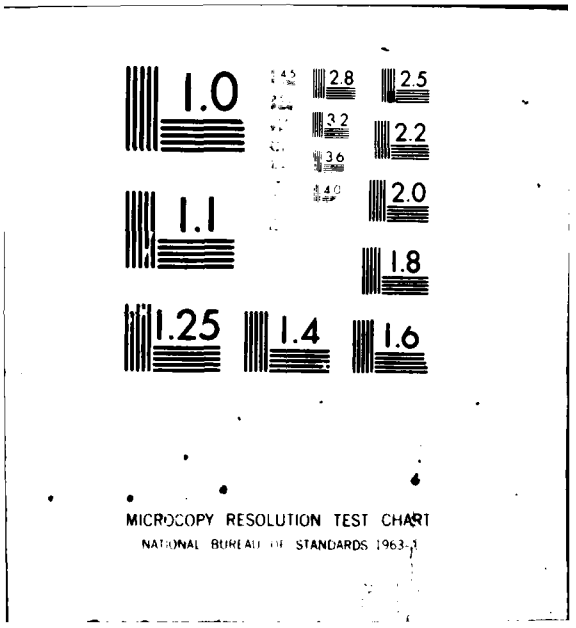
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

In the sections of the gas pipes, which have protector defense, as the monitoring and measuring areas can be utilized their contact conclusions/derivations.

Are not subject to use as the checks point the branching of gas pipes into the possessions, isolated from the distributive gas pipes by the catches or other devices with the flange joints.

5.8. For position finding of gas pipes, close fitting valve and other devices it is necessary to provide for setting up of tablet-indicators.

Tablet-indicators should be established/installed in the walls of buildings and constructions and in the special reference columns, made on the affirmed stardards.

6. Defense of gas pipes from the corrosion.

6.1. Design of measures for defense of gas pipes from soil corrosion and stray current corrosion must be produced in accordance with demands of present chapter, and also demands of chapters SNIP I-C,27-62 "Defense of structures from corrosion. Materials and articles, stable against the corrosion", III-G.6.1-62 "The defense of underground metallic constructions from the corrosion. The rules of

production and inspection/acceptance of works" and "It straightened the defense of underground metallic constructions from the corrosion" (SN 266-63).

6.2. For appraisal of corrosion activity of soils of experiment it should be performed by several methods in parallel.

As the basis should be applied the field electrical method according to which the corrosion activity of soils is evaluated according to data of the measurements of their specific resistance. As the additional ones (auxiliary) are recommended the laboratory methods: the decrease in weight of the standard sample/specimen of metal tube, chemical analysis of soils, etc.

6.3. The corrosion of soils depending on their specific resistance and on decrease in weight of metal tube is given in Tables 13 and 14.

Table 13. Corrosion activity of soil in depending on its specific resistance.

(1) Величина удельного сопротивления грунта в ом·м	(2) Более 100	(3) (4) От 20 до 100	(3) (4) От 10 до 20	(3) (4) От 5 до 10	(5) Менее 5
(6) Коррозийная активность грунта	(7) Низкая	(8) Средняя	(9) Повышенная	(10) Высокая	(11) Весьма высокая

Key: (1). Value of specific resistance of soil in Ω·m. (2). It is more. (3). From. (4). to. (5). It is less. (6). Corrosion activity of soil. (7). Low. (8). Average/mean. (9). Increased. (10). High. (11). Very high.

Table 14. Corrosion activity of soils depending on the decrease in weight of metal tube.

(1) Потери веса трубки в г	(2) До 1	(3) (4) От 1 до 2	(3) (4) От 2 до 3	(3) (4) От 3 до 6	(4) Более 6
(5) Коррозийная активность грунта	(6) Низкая	(7) Средняя	(8) Повышенная	(9) Высокая	(10) Весьма высокая

Key: (1). Decreases in weight of tube in g. (2). To. (3). From. (4). It is more. (5). Corrosion activity of soil. (6). Low. (7). Average/mean. (8). Increased. (9). High. (10). Very high.

6.4. Determination of specific resistance of soils for designed assignment must be produced with grid of measurements not less frequent 500x500 m with mapping or diagram of corrosion activity of soils.

For developing the working drawings the measurements of specific resistances of soils must be produced on the route of the gas pipe through 100-200 m depending on the degree and colorfulness of corrosion of soils.

Note. In the presence of the disagreement of the values of the measurements of corrosion of soils between two points 10 times and more is required the execution of additional measurements at the intermediate points of section.

6.5. Safety methods of gas pipe from soil corrosion should be selected, being guided by data of Table 15.

6.6. Sections of gas pipes, laid through water obstacles, swampy places, immersed flocdplains of rivers, places of former dumps of debris, slags, flows from factories and plants, under railroad, tramroads and highways and in regions with clearly expressed danger of damages by stray currents, independent of the corrosiveness of soils must have very reinforced insulation.

6.7. Introductions/inputs of gas pipes into separate buildings, and also distributive gas pipes, which pass on territory where there are sources of possible increase in corrosion activity of soil, must be covered/coated with anticorrosion insulation/isolation by one class are higher than is required by the corrosiveness of soil.

6.8. As anticorrosion insulation/isolation they can be used: bituminous and bituminous-rubber coatings with use/application of reinforcing wrappers from bituminous-rubber waterproofing material or fiberglass material, coating from polymeric materials (in the form of strips/films or in powder-like state), and also cement-gunited and asphalt coatings (with surface packing of gas pipes by method of

extrusion without cover) and other constructions/designs of anti-corrosion insulation/isolation.

6.9. Exemplary constructions/designs and thicknesses of anticorrosion insulation of different types are given in Tables 16, 17 and 18.

Table 15. Safety methods of underground steel gas pipes from the soil corrosion.

(1) Коррозионная активность грунта	(2) Рекомендуемая защита
Низкая (3)	(4) Нормальная изоляция для газопроводов низкого давления с толщиной стенки труб не менее 5 мм (5) Усиленная изоляция для остальных газопроводов
Средняя (6)	(7) Усиленная изоляция
Повышенная (8)	(9) Весьма усиленная изоляция
Высокая (10)	(11) Весьма усиленная изоляция и катодная поляризация
Весьма высокая (12)	(13) То же

Note. The phasic nature of the design of the electrical defense of gas pipes from the soil corrosion should be accepted, being guided by requirements p. 6.11.

Key: (1). Corrosion activity of soil. (2). Recommended defense. (3). Low. (4). Normal insulation/isolation for low-pressure gas pipes in wall thickness of ducts is not less than 5 mm. (5). Reinforced insulation for remaining gas pipes. (6). Average/mean. (7). Reinforced insulation. (8). Increased. (9). Very reinforced insulation. (10). High. (11). Very reinforced insulation and cathodic polarization. (12). Very high. (13). The same.

Table 16. Exemplary/approximate constructions/designs of bituminous insulation/isolation of steel gas pipes with the reinforcing wrappers from the bituminous-rubber waterproofing material or the fiberglass material.

(1) Тип изоляции	(2) Покрытие	(3) Толщина покрытия в мм	(4) Общая толщина в мм
(5) Нормальная	(6) Грунтовка	—	3
	(7) Битумная мастика	3	
	(8) Крафт-бумага	—	
(9) Усиленная	(6) Грунтовка	—	6
	(7) Битумная мастика	3	
	(10) Армирующая обертка	—	
	(7) Битумная мастика	3	
(11)	(8) Крафт-бумага	—	
Весьма усиленная	(6) Грунтовка	—	9
	(7) Битумная мастика	3	
	(10) Армирующая обертка	—	
	(7) Битумная мастика	3	
	(10) Армирующая обертка	—	
	(7) Битумная мастика	3	
	(8) Крафт-бумага	—	

Notes: 1. The layers of mastic, given in the table, can be applied:

with the machine method - in one step;

with the manual method - in two stages.

2. As reinforcing wrapper one should apply glass-fiber-reinforced canvas-like fabric VV-G.

Key: (1). Type of insulation/isolation. (2). Coating. (3). Thickness of coating in mm. (4). Overall thickness in mm. (5). Normal. (6). Priming. (7). Bitumastic. (8). Kraft paper. (9). Intensified. (10). Reinforcing wrapper. (11). Very intensified.

Table 17. Exemplary/approximate constructions/designs of bituminous-rubber insulation of steel gas pipes with the reinforcing wrappers from the bituminous-rubber waterproofing material or the fiberglass material.

(1) Тип изоляции	(2) Покрытие	(3) Толщина покрытия в мм	(4) Общая толщина в мм
(5) Нормальная	(6) Грунтовка	—	
	(7) Битумно-резиновая мастика	3	3
	(8) Крафт-бумага	—	
(9) Усиленная	(6) Грунтовка	—	
	(7) Битумно-резиновая мастика	4	5,5
	(10) Бризол	1,5	
(9) Усиленная	(6) Грунтовка	—	
	(7) Битумно-резиновая мастика	4	4
	(11) Стекловолокнистый материал	—	
(12) Весьма усиленная	(6) Грунтовка	—	
	(7) Битумно-резиновая мастика	3	
	(10) Бризол	1,5	8,5
	(7) Битумно-резиновая мастика	2,5	
	(10) Бризол	1,5	
(12) Весьма усиленная	(6) Грунтовка	—	
	(7) Битумно-резиновая мастика	4	
	(11) Стекловолокнистый материал	—	7,5
	(7) Битумно-резиновая мастика	3,5	
	(11) Стекловолокнистый материал	—	
(12) Весьма усиленная	(6) Грунтовка	—	
	(7) Битумно-резиновая мастика	4,5—5	
	(13) Стекловолокнистый материал (наносимый с нахлестом витков на 50% ширины полотнища)	—	8—9
	(7) Битумно-резиновая мастика	3,5—4	
	(8) Крафт-бумага	—	

Notes: 1. The layers of mastic, given in the table, can be

applied:

with the machine method - in one step;

with the manual method - in two steps.

2. As fiberglass material one should apply glass-fiber-reinforced canvas-like fabric VV-G.

Key: (1). Type of insulation/isolation. (2). Coating. (3). Thickness of coating in mm. (4). Overall thickness in mm. (5). Normal. (6). Priming. (7). Bituminous-rubber mastic. (8). Kraft paper. (9). Intensified. (10). Bituminous-rubber waterproofing material. (11). Fiberglass material. (12). Very intensified. (13). Fiberglass material (applied with overlap of turns to 50% of width of width).

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6.10. Methods of electrical defense of underground gas pipes include:

a) defense with the aid of electrical drainages (straight lines, polarized, intensified);

b) cathode protection by external current;

c) protector defense.

In the case when with one of safety methods it is not possible to ensure the required shielding potentials in all sections of the shielded gas pipes, should be applied defense by combination of two or more enumerated methods.

Additionally to the devices of electrical defense should be applied the insulating insets (flanges).

6.11. Design of electrical defense from stray currents for gas pipes can be accomplished/realized into one or two stages in depending on local conditions of building. At the stage of designed assignment, and during the single-stage design - in the working drawings of the design of gas pipe, are determined tentative volumes and cost/value of the forthcoming works on the defense of gas pipe from the corrosion, including type of electrical defense and arrangement/position of means of defense.

The development of the working drawings of electrical defense is produced after packing of gas pipe into the soil and its fillings in the actual values of the measured potentials "gas pipe-ground". At

this point are established the optimum parameters of the electrical defense, which ensure on the gas pipe shielding potentials, in the limits, indicated in Table 19, and also the effect of electrical defense on other underground metallic constructions. When this effect exceeds the effective norms, then is developed the project of the combined electrical defense of gas pipe and adjacent underground metallic constructions.

Table 18. Exemplary/approximate constructions/designs of insulation/isolation from the adhesive tapes of polyvinyl chloride or polyethylene for the steel gas pipes.

(1) Тип изоляции	(2) Покрытие	(3) Общая толщина в мм
(4) Нормальная	(5) Грунтовка (6) Липкая лента в один слой	0,25—0,3
(7) Усиленная или весьма усиленная	(5) Грунтовка (8) Липкая лента в два слоя	0,6—0,7

Key: (1). Type of insulation/isolation. (2). Coating. (3). Overall thickness in mm. (4). Normal. (5). Priming. (6). Adhesive tape into one layer. (7). Intensified or very intensified. (8). Adhesive tape into two layers.

Table 19. Minimum and maximum permissible potentials for the steel constructions.

(1) Защитный потенциал	(2) Допустимый защитный потенциал по отношению к неполяризующемуся электроду сравнения в в	
	(3) водородному	(4) медносульфатному
(5) Минимальный для всех сред	—0,55	—0,87
(6) Максимально допустимый для всех сред:		
(6а) а) для сооружений с противокоррозийным покрытием	—0,9	—1,22
(6б) б) то же, с противокоррозийным покрытием, имеющим частичное разрушение	—1,2	—1,52
(6в) в) то же, без противокоррозийного покрытия	(7) Допустимый защитный потенциал ограничивается вредным влиянием на соседние металлические сооружения	

Key: (1). Shielding potential. (2). Permissible shielding potential with respect to nonpolarizing electrode of comparison in V. (3). hydrogen. (4). copper-sulfate. (5). Minimum for all media. (6). Maximum permissible for all media. (6a). for the constructions with the anti-rust coat. (6b). then, with the anti-rust coat, which has partial destruction. (6c). then, without the anti-rust coat. (7). Permissible shielding potential is limited to adverse effect on neighboring metallic constructions.

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The devices of electrical defense or the gas pipe must be

constructed and put into use in the first year after the termination of the building of gas pipe, if in the anode and alternating zones, caused by stray currents, an average/mean difference in the positive potentials "gas pipe-ground" exceeds 0.1 V, but not more than 0.5 V. When an average/mean difference in the positive potentials exceeds 0.5 V, such gas pipes are subject to electrical defense to their putting to use, but not later than 6 months after the termination of building.

Note. If an average/mean difference in the positive potentials does not exceed 0.1 V, the electrical defense of such gas pipes is accomplished/realized in the planned order, established by executive committees of the local councils of the deputies of laborers.

6.12. Above-ground gas pipes must be shielded from corrosion by oil paint, varnish or other coatings, which age temperature changes and effects of atmospheric residues/settlings.

7. Gas-regulator areas are general requirements.

7.1. For decompression of gas and its maintenance at prescribed/assigned levels they must be provided for:

a) gas-regulator areas, planned in territory of cities and other

populated areas, and also in territory of industrial, municipal and other enterprises;

b) gas-regulator installations planned within gasified buildings.

7.2. Gas-regulator areas and gas-regulator installations depending on value of gas pressure during introduction/input into them are divided into:

a) gas-regulator areas and gas-regulator installations of mean pressure with gas pressure to 3 kg/cm²;

b) gas-regulator areas and gas-regulator high-pressure installations with gas pressure are more than 3 to 12 kg/cm².

7.3. Optimum number of gas-regulator areas and gas-regulator installations in system of gas supply of city, settlement or individual enterprise is determined by planning organization on the basis of technical and economic calculations.

7.4. Arrangement/position of gas-regulator installations in industrial and municipal enterprises, enterprises of domestic service and other users of gas should be produced in accordance with

requirements of section of 8 chapters SNIP II-g.11-66 "gas supply. Internal devices. Norms of design".

7.5. Selection of system of account of gas flow, and also arrangement/position of counters and flow gauges in industrial and municipal enterprises, enterprises of domestic service and other users of gas should be produced in accordance with requirements of section of 7 chapters SNIP of the II-g.11-66.

CONDITIONS OF POSITIONING THE GAS-REGULATOR AREAS.

7.6. In depending on gas pressure during introduction/input and at output/yield, and also into dependence on designation/purpose gas-regulator areas can be placed:

a) in separate buildings;

b) in annexes to buildings;

c) out of buildings in cabinets, installed on incombustible wall of gasified building or on separate incombustible support;

d) on incombustible coating of industrial building in which are placed users of gas.

To provide for the device of gas-regulator areas in the basement and basement rooms, and also in the wells is not allowed/assumed.

7.7. In territory of industrial enterprises is allowed/assumed arrangement/position of equipment of gas-regulator areas on open pads, under mounting fixture, if atmospheric conditions will not affect work of installed equipment.

Is allowed/assumed also carrying out from the gas-regulator areas of equipment component (for example, catches, filters, etc.) on the pads next to the buildings of gas-regulator areas.

In all cases during the open external arrangement/position of equipment gas-regulator areas must have enclosures/protections.

7.8. Separate gas-regulator areas can be placed in gardens, gardens, within residential sections, in territory of industrial and municipal enterprises at distances from buildings and constructions those not less indicated in Table 2C.

7.9. Is allowed/assumed arrangement/position of gas-regulator areas of average/mean and high pressures. (with gas pressure to 6 kg/cm²), intended for gas supply of industrial and communal general enterprises, in annexes to buildings.

Gas-regulator areas with the gas pressure during the introduction/input of more than 6 to 12 kg/cm² can be placed in the annexes to the shops, in which for the conditions of technology is required the use of gas with the pressure of more than 6 kg/cm².

The buildings to which are attached gas-regulator areas, must be the I and II degree of refractoriness with the productions, placed on the fire hazard in categories G and D.

7.10. Arrangement/position of cabinet gas-regulator areas is allowed/assumed to provide for on walls of gasified buildings not lower than III degree of refractoriness with productions, placed on fire hazard in categories G and D.

Cabinets must be provided for from the incombustible materials, have in the lower and upper parts of the hole for the ventilation and be arranged at the height convenient for maintenance/servicing and repairing the established/installed equipment.

During the arrangement/position of cabinet gas-regulator area on the wall of building the distance from the cabinet to the window or the door must be accepted not less than 1 m.

Cabinet gas-regulator areas on the separate support must be furnished from the buildings and the constructions at a distance according to Table 20.

Table 20. Minimum distances from the separate gas-regulator areas to the buildings and the constructions.

(1) Давление газа на вводе в газорегуляторный пункт в кгс/см²	(2) Расстояния по горизонтали в свету в м			
	(3) до зданий и сооружений	(4) до железнодорожных и трамвайных путей (до ближайшего рельса)	(5) до автомобильных дорог	(6) до воздушной линии электропередачи
(7) До 6	10	10	5	(8) Не менее 1,5 (10) высоты опоры
(9) Более 6 до 12	15	15	8	

Note. The distances, given in the table, are spread also to open type gas-regulator areas.

Key: (1). Gas pressure during the introduction/input into the gas-regulator area in kg/cm². (2). Distances on horizontal in light/world m. (3). before buildings and constructions. (4). to railroad and tramroads (to nearest rail). (5). to highways. (6). to air electric power line. (7). To. (8). Not less. (9). More than 6 to 12. (10). height of support.

REQUIREMENTS FOR THE ROOMS OF GAS-REGULATOR AREAS.

7.11. Rooms of gas-regulator areas must be provided for by single-stage ones of I and II degree of refractoriness and satisfy requirements, presented in to productions, related by fire hazard to

category A with coating light-density construction whose weight is not more than 120 kg/m².

The use/application hard-to-eject by the blast wave of coatings of gas-regulator areas is allowed/assumed in the total area of window apertures and light lamps/canopies not less than 500 cm², to each cubic meter of the internal volume of dangerously explosive room.

The walls which divide the basic and auxiliary rooms of gas-regulator areas, must be furnished on the foundation, connected with the foundation of external walls, and also must be connected with the carrying (basic) walls buildings. With the execution of the dividing walls of the brick their thickness must be not less than into one brick with the plastering from two sides.

The device of smoke and air channels within these walls, and also within the walls, to which are attached gas-regulator areas, is not allowed/assumed.

The annexes in which are placed gas-regulator areas, must be disengaged buildings by anechoic wall and have independent exit. The doors of rooms must be opened/disclosed outside.

Rems must be provided for fire the nonflammable materials, which

do not give sparking with the stock (for example, asphalt concrete, linoleum, etc.).

Around the buildings of gas-regulator areas must be provided for the blind area.

7.12. Need for heating of rooms of gas-regulator areas is established by project in depending on climatic conditions, humidity of transported gas and construction/design of regulators used and monitoring and measuring instruments.

The heating of the rooms of gas-regulator areas can be provided for water or steam both from the centralized heat source and from the individual heat installation (water heater AGV, boiler of VNIISTO [All-Union Scientific Research Institute of Sanitary Engineering Equipment]-mc, etc.), arranged/located after the blind wall of the working rooms of gas-regulator areas.

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The furnace heating of gas-regulator areas is allowed/assumed sometimes under the condition for the execution of furnace in the form of airtight metal casing with the heating, which publishes outside or into the part of the building, which is not imparted with

other working rocms of gas-regulatcr areas. The temperature cf the heated rocms of gas-regulatcr areas must be accepted not less than 5°C.

7.13. Ventilaticn cf buildings of gas-regulator areas must be prcvided for, as a rule, by natural and provide exchange of air in placements not less triple in hcur.

EQUIPMENT OF GAS-REGULATCR AREAS.

7.14. In each gas-regulatcr area it is necessary tc provide for installatien cf follcwirg equipment: filter fcr scrubbing cf gas frcm mechanical impurities, safety-lccking valve, pressure regulatcr, cutflcw protecting device at cutput/yield of gas, close fitting valve and manometers fcr measurement cf gas pressure at entrance and exit, and also construction cf bypass line (bypass).

On the industrial enterprises and other units, which dc not allow/assume according tc the ccnditicns cf the production of interruptions in the gas supply, one should provide for the device cf gas-regulator areas with twc and mcre in parallel and by the independently working regulators. In such gas-regulatcr areas safety-locking valves are nct prcvided fcr, but is established/installed scnic and light signaling about increase and

lowering in the gas pressure over the established/installed limits.

During the arrangement/position of gas-regulator installations in the enterprise directly in the shops the installation of filters to provide for it is not necessary, if during the introduction/input of gas pipe in the enterprise is a centralized area of scrubbing of gas. In the gas-regulator installations distant from the area of scrubbing of gas it is more than or 1000 m, the installation of filter is necessary.

On the bypass line (bypass) it is necessary to provide for the installation of two tripping devices.

7.15. With equipment installation of gas-regulator areas it is necessary to provide for access to equipment for its assembly, maintenance/servicing and repair.

The distance between the parallel ranks of the equipment of gas-regulator areas must be in the light/world not less than 40 cm. The width of basic pass in the room must be not less than 0.8 m.

During the arrangement/position of equipment at the height of more than 2 m must be provided for the areas/sites with the staircases, protected/surrounded by rails.

The packing of gas pipes in the channels of the floor/sex of gas-regulator areas is not reccmmended.

The installation of fittings, equipment, and also the device of flanged and threaded connections in the channels are not allowed/assumed.

7.16. Selection of pressure regulator should be produced, on the basis of maximum calculated gas flow users and required drop/jump pressure during reduction. The throughput capacity of regulator one should accept upon 15-20% more than maximum calculated gas flow.

If the minimum gas flow in the initial period of the operation lower than minimum calculated (designed), with which the firm work of pressure regulator cannot be provided, should be provided for the temporary/time installation of pressure regulator with a small throughput capacity.

In the cases of sharp daily variations of the gas flow one should provide for device of two or more gauging lines.

7.17. Outflow protecting devices one should install pressure

regulator of gas after flow gauges.

Safety-locking valves are established/installed before pressure regulators.

7.18. As protective outflow devices should be applied safety valves, selected in depending of gas pressure in accordance with recommendations of chapter SNIP I-g.9-66 "gas supply. External networks/grids and constructions. Materials, fittings and part".

7.19. Necessary working section/cut of spring outflow safety valve F in cm² should be determined from formula

$$F = \frac{q}{220P}\sqrt{\frac{T}{M}}\ cm^2, \qquad (10)$$

where q - necessary throughput capacity of valve in kg/h;

P - absolute pressure of gas under valve in kg/cm² (are accepted on 0.5 kg/cm² higher than worker at pressure of gas to 3 kg/cm² and on 15o/o higher than worker at pressure of gas more than 3 kg/cm²);

T - temperature of gas in °K;

M - molecular weight of gas.

The necessary diameter of valve seat is determined:

for the full-lift valves with h>0.25d according to the formula

$$d = 1{,}13\sqrt{F}\,см; \qquad (11)$$

For incompletely-removable valves with 0.05d<h<0.25d according to the formula

$$d = 0{,}45\frac{F}{h}\,см, \qquad (12)$$

where h - valve lift in cm.

Notes: 1. When, before the manuevering valves, of special safety-locking valves are present, or during the installation after gas-regulator areas in the users or the additional regulating units value q should be taken as the equal not less than 10%/o of the throughput capacity of the greatest of the manuevering valves of the control system of gas-regulator areas.

2. In other cases value q should be taker not less throughput capacity of greatest of manuevering valves pressure minus value of possible minimum consumption or gas.

7.20. Showing manometers must be provided for during introduction/input and or all conclusions/derivations of

gas-regulator areas. The need for the installation of pressure recording gauges is established by planning organization.

7.21. Candles for blasting of gas pipes and from safety valves of gas-regulator areas must be derived/concluded outside into places, which ensure safety of surrounding buildings and constructions, but not less than on 1 m higher than cornice of building of gas-regulator area.

The candles, which discharge gas from the protecting devices of the cabinet gas-regulator areas, installed on the separate supports, must be derived/concluded to the height not less than on 4 m of the ground level, but during the installation of cabinet gas-regulator areas on the walls of buildings - on 1 m it is higher than the cornice of building. The conditional diameter of candle must be not less than 19 mm.

7.22. Monitoring and measuring instruments (KIP) with electric drive, installed indoors of gas-regulator areas, must be in explosion-proof performance. Instruments in the normal performance can be installed in accordance with of requirements of p. 7.26.

ELECTRICAL EQUIPMENT. Lightning protection. communications.

7.23. Electrical equipment of gas-regulator areas and measures for lightning protection must be projected/designed in accordance with requirements of "temporary/time indications in accordance with design and device of lightning protection of buildings and constructions" (SN 305-65), "rules of device of electrical devices" (PUE) ministries of Power engineering and Electrification of USSR, and also with demands of present chapter.

7.24. Electric lighting of gas-regulator areas can be internal in explosion-proof performance or external in normal performance (obliquely).

Electrical switchboards must be installed outdoors of gas-regulator area or in the adjacent room, intended for positioning/arranging the equipment of tele-automation or heating boiler.

The metallic parts of the electrical devices which are not under voltage must be grounded.

7.25. Gas-regulator areas, arranged/located from buildings and constructions at a distance, which exceeds height of these buildings, must be equipped by separate or established/installed on building of gas-regulator areas lightning controls.

In the case of applying the lightning controls, adjusted on the building of gas-regulator area, the packing of current taps should be provided for directly on the walls of gas-regulator area and each of them must be connected to grounded electrode with pulse resistance to spreading not more than 10 ohms.

Grounded electrode is recommended to furnish in the earth/ground out of the building along its contour/outline at a distance of 0.8-1 m from the foundations of the building of gas-regulator area.

To the grounded electrode of defense from the direct impacts of lightning is not allowed/assumed the connection of working shielding grounding.

7.26. In each gas-regulator area one should provide for the installation of telephone set, which, as a rule, must be in explosion-proof performance.

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During the installation of vehicle in the normal performance the latter one should be installed out of the placement of gas-regulator

area in the niche (for example, in the metallic locking box) or in the adjacent room, intended for the equipment of tele-automation or heating boiler.

8. Telemechanization of the systems of gas supply.

GENERAL REQUIREMENTS.

8.1. Use/application for systems of gas supply of cities and other populated areas and industrial objectives of complex (telemetry, remote control, remote signal system and automatic adjustment of pressure regulators) or partial telemechanization (telemetry, remote signal system and automatic adjustment of pressure regulators) must be substantiated by technical and economic calculations and conditions of guaranteeing optimum pressure schedules, safe and reliable operation.

8.2. Telemechanical systems, used in systems of urban gas supply, must provide:

a) centralized control of prescribed/assigned parameters of pressure and gas flows in different controlled/inspected areas (KP) of system of urban gas supply;

b) signaling of deviations of controlled/inspected parameters from prescribed/assigned values;

c) signaling of operative condition of safety-locking devices, which operate blind networks/grids, stop cocks, linear catches, systems of heating and other devices of two-position control;

d) maintenance of optimum pressure schedules of gas in distribution networks with change in gas flows;

e) the central control of stop cocks and adjustment of pressure regulators.

Notes: 1. Remote control with stop cocks is recommended to apply on the critical/heavy-duty areas of the system where according to operating conditions is necessary urgent cutoff/disconnection and start of the individual sections of distributive gas piping systems.

2. Remote control with adjustment of pressure regulators is recommended to apply for gas-regulator areas with sharply changing loads, and also for gas-regulator areas of buffer enterprises, which work on prescribed/assigned graph of gas consumption.

8.3. System of telemechanization must be projected/designed so

that damages of telemechanical systems or channels of communication (i.e., loss of remote control, telemetry and remote signal system) . would not cause changes in situation or work of basic controlled/inspected or controlled aggregates/units of system of gas supply.

8.4. During design of telemechanization of system of gas supply must be taken into consideration requirements of "rules of device of electrical devices".

MEANS OF TELEMECHANIZATION.

8.5. Means of telemechanization are: devices of remote control, remote signal systems, telemetry and communication channels, and also dispatcher panels, panels - mnemo-plans/mnemo-layouts and power supplies.

8.6. During design of systems of telemechanization it is most expedient to provide for use multichannel communicating systems.

8.7. In system of gas supply for measuring opposite parameters of gas one should provide for use/application of system of telemetry, which does not require installation of diverse measuring equipment.

For the purpose of the decrease of a number of telegauges on the control rooms for measuring both the similar/analogous and opposite parameters of gas should be, as a rule, provided for general/common/total receiving instruments.

Note. For measuring the different limiting parameters of gas one should provide for general/common/total instruments with the scale, calibrated completely in the percentages.

8.8. Arrangement/position of equipment for control and direction is recommended to provide for in the following form: on dispatcher panel are furnished calling keys of telemetry, control and receipting or telephone dials, utilized for the same goal, and also receiving instruments of telemetry and light signal panel-numerators.

8.9. On mnemo-plan/mnemo-layout at points of arrangement of controlled/inspected areas must be placed signal lights (green - normal mode of work of objective and red - trouble signaling). Emergency light signaling must be accompanied by the accustic acknowledged signal.

8.10. Redundancy of feeding of telemechanical systems or control room probably as a rule, from second source of alternating current (transformer substation).

Sometimes is allowed/assumed spare feeding from the storage battery, which works in the regime of permanent booster charge. The redundancy of the feeding of telemechanical systems on the controlled/inspected areas is not required.

8.11. Feeding of telemechanical systems on controlled/inspected areas in depending on the installed equipment can be accomplished/realized both from local source of alternating current of supply voltage and it is centralized.

8.12. In controlled/inspected areas must be provided for possibility of two-way telephone communication with control room along lines of communications, utilized for telemechanics. Is allowed/assumed the interruption of telemetry and control with the telephone conversation.

8.13. System of telemechanics must provide from the side of control room control of soundness of lines of communications with controlled/inspected areas.

VOLUME OF TELEMECHANIZATION.

8.14. Volume of telemechanization (quantity of telemechanized objectives) of system of gas supply must be minimally necessary and be combined with level of existing automation on objectives of system.

8.15. Volume of remote signal system must ensure transmission to control room of preventive/warning and emergency signals with deviation of controlled/inspected parameters of gas from established/installed norms, and also other deviations from normal operation of controlled/inspected areas. Emergency signals must be supplied from the controlled/inspected areas without dispatcher's call.

8.16. Volume of telemetry must ensure to dispatcher personnel possibility of measurement of basic parameters of gas, which reflect work of system of gas supply, and necessary for dispatcher both for rational operational control of system of gas supply and for possibility of localization and liquidation of emergencies.

Note. During the determination of the volume of telemetry it is necessary to examine possibility, sometimes, the replacement of telemetry by remote signal system.

8.17. Telemetry in all systems of gas supply can be accomplished/realized on call from control room with reproduction of values of parameters of gas on reading instruments and method of cyclic interrogation with automatic recording of parameters of gas.

Note. The volume of recording parameter values of gas on the control room must be substantiated.

8.18. Volume of remote control must ensure to dispatcher personnel control capability of adjustment of pressure regulators of gas and of stop cocks on gas pipes for establishment of most rational operating conditions in system of gas supply, and also for fastest localization and liquidation of emergencies, if this problem is not solved by means of automation.

8.19. In urban system of gas supply of telemechanization they are subject:

a) exits of all gas-distributing stations;

b) all gas-regulator high-pressure areas, which feed rung gas piping systems of high and mean pressure;

c) all gas-regulator areas, which operate blind gas piping systems;

d) most characteristic gas-regulator areas in ring low-pressure networks/grids, which have great effect on redistribution of gas in network/grid;

e) gas-regulator areas of major industrial enterprises, which require control and direction, in particular gas-regulator areas of buffer enterprises.

The volume of the telemechanization of each controlled/inspected area must be accepted in accordance with tables 21.

Table 21

(a) № п/п	(b) Наименование контролируемого пункта	(c) Телеизмерение		
		(d) давления газа		(g) расхода газа
		(e) входного	(f) выходного	
1	Газораспределительная станция	—	П—В	П—В
2	Газорегуляторные пункты высокого давления, питающие закольцованные сети высокого и среднего давления	П—В	Р—Ц; П—В	—
3	Газорегуляторные пункты, обслуживающие тупиковые газовые сети	—	Р—Ц; Р—В	—
4	Газорегуляторные пункты наиболее характерные в закольцованных газовых сетях низкого давления	П—В	Р—Ц; П—В	—
5	Газорегуляторные пункты промышленных предприятий, требующих контроля и управления	Р—Ц; П—В	—	Р—Ц; Г—В

Notes: 1. By letters tney are designated: P - a telemetry shcwing; V - interrogatica cn the call; F - telemetry recorded; Ts - interrogation cyclic.

2. For all controlled/inspected areas is prcvided for: remote signal system; remcte ccntrcl (except pcs. 1, 3, 4); telephcne communication (except pcs. 5) and automatic ccntrcl units cf cutlet pressura according tc gas flcw.

3. On pos. 1 and 2 is prcvided for remcte signal system cf

limits of input and cutlet pressures, while cn pcs. 3, 4 and 5 - remcte signal system of limits cf cutlet pressure.

Key: (a). No in sequence. (b). Designatien cf ccntrclled/inspected area. (c). Telemetry. (d). gas pressure. (e). Inlet. (f). Exit. (e). gas flow. (1). Gas-distributing station. (2). Gas-regulator high-pressure areas, which feed rung networks/grids cf high and mean pressure. (3). Gas-regulatcr areas, which operate blind gas piping systems. (4). Gas-regulatcr areas most characteristic in rung low-pressure gas piping systems. (5). Gas-regulatcr areas of industrial enterprises, which require ccntrcl and direction.

SELECTION OF THE DIAGRAM OF DISPATCHER COMMUNICATIONS.

8.20. During design cf telemechanizatien in urban gas economies can be taken following diagrams cf dispatcher ccmmunications:

a) single-stage DE-KE (ccntrcl rcom - ccntrclled/inspected areas), when there are straight/direct disengaged telephone lines cf communications between ccntrcl rccm and all ccntrclled/inspected areas;

b) two-stage TsDP-RLP-KP (central control room area-local dispatcher area-monitored areas), when there are local control rooms, which are located in different city districts;

c) circular TsDP-KP (central control room - controlled/inspected areas), when is limited a quantity of free pairs of telephone leads/ducts with the use/application of selector communications of all controlled/inspected areas with the central control room.

LINES OF COMMUNICATIONS.

8.21. As lines of dispatcher communications must, as a rule, be utilized straight/direct wire (cable and air) lines of urban telephone network/grid, isolated for purposes of telemechanization. In the absence go conductors can be used engaged lines of telephone communication.

8.22. Design of lines of communications for telemechanization must be performed in accordance with rules on building of linear constructions of urban telephone networks/grids.

8.23. Terminals in cable car cases, boxes and cabinets, relating to telemechanical channels communications, must have appropriate designations.

DISPATCHER AND MONITORED AREAS.

8.24. Control room must have the following rooms:

a) control room in which are placed panel with mnemo-plan/mnemo-layout and dispatcher panel;

b) instrument room in which is placed equipment, which does not require permanent observation dispatcher's on the part;

c) workshop for production of minor overhaul and adjustment of telemechanical equipment;

d) auxiliary service rooms (storeroom, room of rest, toilet).

8.25. Temperature of air in controlled/inspected areas in which is provided for arrangement/position of telemechanical systems, must be not lower than +5 and not higher than +40°C.

8.26. Telemechanical systems, provided for to installation on controlled/inspected areas, must be, as a rule, in explosion-proof performance.

During the use/application of telemechanical systems in the normal performance their arrangement/position must be provided for only in the blast-proof rooms.

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